PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

CENTREVILLE, MICHIGAN,

JANUARY 15 AND 16, 1891.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF CENTREVILLE.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1891.]

[NO. 363.]

SEAL.

BY AUTHORITY.

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1891.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

CENTREVILLE, JANUARY 15 AND 16, 1891.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH,
FOR THE YEAR 1891.

[No. 363.]

Robert Smith & Co., State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

CENTREVILLE SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT CENTREVILLE, MICH.

JANUARY 15 AND 16, 1891.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1891.

[The publication of the Proceedings of the Centreville Sanitary Convention has been very much delayed on account of the unusual difficulty of collecting the manuscripts of the papers and addresses.]

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Centreville, acting with a committee of the State Board of Health.

The following-named persons constituted the committees:

Committee from the State Board of Health—Henry B. Baker, M. D., Lansing.

Local Committee—Marden Sabin, M. D.; L. H. D. Pierce, M. D.

Executive Committee—Frank S. Cummings; William F. Pack.

Music Committee—George Keech.

The officers of the Convention were:

President—Rev. A. P. Peeke.

Vice-Presidents—Hon. Leverett A. Clapp, Centreville; Hon. David Bateman, Centreville; Hon. Edwin Stewart, M. D., Mendon; W. M. Ikeler, M. D., Three Rivers; W. H. Chivers, M. D., Colen; William Sadler, Esq., Centreville.

Secretary—L. H. D. Pierce, M. D., Centreville, Mich.

First Session, Thursday, January 15, at 2:30 P. M.

The convention was called to order by President Rev. A. P. Peeke. After music by Mrs. Cummings, Mrs. Campbell, Misses Buell, Starr and Cummings, Charles O. Gregory, and Rev. A. P. Peeke, with Miss Belle Alexander accompanist, the following address was given:

ADDRESS OF WELCOME.

BY ALONZO PALMER, VICE-PRESIDENT OF THE VILLAGE.

There is in ancient history written nearly nineteen hundred years ago, a record of a very pleasant gathering, (not however a Sanitary Convention), where the precedent was established of saving "the best of the wine for the last of the feast."

That rule is present in this convention, as regards speakers, which accounts for your humble servant being detailed to shoot off some remarks at the opening; and we are thankful that under this rule very little will be expected, consequently no disappointments will occur.

Among the unwritten, unchangeable laws of nature, and of our being, the fact is ever before us that in every perfectly developed human organization, there should exist three conditions; each condition dependent on the others for perfect development, and all together necessary to obtain the full end and aim of human existence. These conditions are life, health, and happiness. Life may exist without imparting health or happiness to its possessor, but health or happiness cannot exist without life, nor can happiness exist to any extent without health. It therefore becomes a pleasure as well as an important duty to study, investigate, and improve all possible means of learning the natural and proper relations of our surroundings as affecting and promoting these natural and necessary conditions of our existence. It is therefore with the greatest pleasure, and with the full expectation of good results that we improve this opportunity of listening to the discussions of this learned body, on so important a subject, by gentlemen in whose education and experience is concentrated the experience of the ages that have passed, as well as the more enlightened and far reaching science of the present time.

Our esteemed fellow citizen, Dr. Sabin, president of our village, and a gentleman high up in the medical profession, one who always takes a lively interest in all sciences that tend to benefit and improve the conditions of individuals, communities and the world, had the pleasure of inviting you to hold this convention in our village, and expected to deliver an address of welcome, and to take a part in your deliberations and discussions. His fellow citizens have been pleased to send him to represent our county in the State Senate, which duty now claims his attention; and deprives you of the pleasure of listening to his welcoming address, which would have been eloquent, comprehensive and complete.

In the absence of Dr. Sabin I have the pleasure, in behalf of the common council and citizens of Centreville and St. Joseph county, of extending to you a cordial and hearty welcome to our village and its hospitalities, with a full assurance of our high appreciation of the honor conferred on us by your presence as well as of the important and lasting benefits that must result from the knowledge to be gained by your deliberations and advice, and hope and believe it may be the means of enlightening us in the way to extend the term of human life, which we believe is possible, far beyond the present average. This result can be accomplished only by preserving health in that perfect condition which a kind providence designed and provided for us in creating us and this beautiful and perfect world that surrounds us, and thereby secure the possession of happiness, which is the most desirable acquirement in this life; and a necessary condition as a preparation for that more perfect and eternal happiness in the life beyond.

And we hope and trust that as a social gathering, this may prove to visitors and citizens a source of pleasant memories for many years to come.

RESPONSE, AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

Henry B. Baker, M. D., secretary of the State Board of Health, Lansing, gave the "Response and statement of the objects of the Convention," expressing thanks for the words of welcome, and stating the objects of the convention somewhat as on the program, namely: "The presentation of facts, the comparison of views, and the discussion of methods relating to the prevention of sickness and of untimely deaths." In the course of his remarks he spoke substantially as follows:

The Sanitary Convention is one of the systematic measures of the State government for the benefit of the health of the people of Michigan. It is one part of the work of an organization by the people of this great State.

In Michigan we have township, city and village organizations, for the purpose of promoting, in these localities, the welfare of the people in their ordinary affairs. We have also county organizations; and finally an organized State, for the promotion of the general welfare. Each locality, county, and State, has its legislative body, and its president, chairman, or governor, as the case may be. To carry out the purposes of localities, counties, and the State, money is required; and to collect and care for this, we have treasurers in each locality and county, and a State treasurer. No one thinks of abolishing these local or county offices. Notwithstanding the fact that the State treasurer's office collects from us about two millions of dollars annually, no one thinks of abolishing the State treasurer's office. Yet no one of us can give a single good and sufficient reason for its existence, aside from the general one—that organization of the people is for the general good.

For the promotion of justice, we have another series of officers—justices of the peace, for local service; circuit courts for broader fields of work; and a State or supreme court for the general use of all the people in the State. No one thinks of abolishing these offices, and especially not of abolishing the State supreme court, which serves to elevate, generalize and give stability and uniformity to the administration of justice throughout the State.

For the safety of life and the promotion of the health of the citizens, we have township, city, and village boards of health, and a State Board of Health to generalize the work, to collect facts from each local board, and to utilize those facts for the use of all the local boards and for all the people of the State; to contribute Michigan's share to the work being done in the United States, and to receive from each other State and from the general government of the United States, so much as is practicable for use in Michigan.

Can it now be truthfully said that no one thinks of abolishing the health service of the State?

It may be useful to consider and to compare the purposes for which our people are organized, as just mentioned,—(1) for political and general affairs; (2) for the promotion of justice; (3) for the safety of life and the promotion of health. General prosperity is important, justice is important, healthful existence is important. I leave with you any question of the relative importance of the several branches of the State government, or whether organization of the people for the safety of life and the promotion of the health of every man, woman and child in the State is or is not of paramount importance.

PRESIDENT'S ADDRESS.

BY REV. A. PAIGE PEEKE, CENTREVILLE, MICHIGAN.

Ladies and Gentlemen:

There is an utterance at once true and divine which declares—all that a man hath will he give for his life. Life is to a man above all price, and yet how reckless we are of the rich inheritance. Health gives to life its charm, and health once wasted, we wither and disappear. Much as we affect to value both health and life, there are few things of which the multitudes know so little or care so little as what constantly concerns both. While the essentials to health are abundant at every hand, the enemies of life lurk on every side. We not only permit their dangerous proximity, but we give them camping grounds within our borders, and hospitably entertain them within our dwellings. Such familiar things as air, and water, and sunlight suggest questions upon whose answer hangs health or sickness, life or death. There are many things that seem insignificant, that are very important, and about these every day home matters that concern our health we hope to learn many things for our common welfare.

A humorous Texan once said—"Galveston is within two miles of the best climate in the world." "What direction must you go?" said a listener. "There is the difficulty;" said he "our good climate is right over our heads." But many people are nearer a healthy, stimulating atmosphere than that, and yet suffer many evils for lack of it. The thickness of the side of your dwelling, or door, or window pane, is all there is between an atmosphere poisoned and destructive to life, and that self-purifying atmosphere that enswathes the earth, blows where it listeth—bearing over and around the world the volume and fragrance of every clime—kissing the waves of the torrid zones, or playing with Odin's frosty locks, and yet bringing on its wings the elements of life for all who breathe. When our living rooms contained the old-time fireplace,—the best ventilator ever invented,—and our sleeping rooms were not so tight but that the snow would be plentiful on our beds some winter mornings, we found the air sufficiently fresh. But with many rooms, in many homes, it is very different today. Sometimes there is no consciousness to the inmates of the necessity of fresh air. It is fortunate in all such cases that doors and windows are not absolutely tight. How offensive and unwholesome the air of some rooms becomes is best known to one who enters from the outside. There is not a room in Centreville large enough for one person to occupy with safety, many hours, without a new supply of air from outside, and yet how little attention is given to ventilation. Somehow people get accustomed to these dangerous practices and live in spite of them. I knew a room 7x9 and 8 feet high, with a north window, which an acquaintance with his wife had occupied night after night for many years, with possibly little thought of danger or even care whether the door and window were open. But when you think of ordinary human breaths, and especially a tobacco chewer's or smoker's breath, and two persons all night in a small unventilated room, in what condition does the atmosphere become when breathed over and over? I know people have lived to good age in spite of these things, but if Sitting Bull had been compelled to sleep alone in such a room every night for a few months, there would have been no need of the U. S. army to kill him. "Tobacco is a slow poison," said a friend to my college mate in solemn warning. "Very slow;" said he "my tobacco-using

ancestors were 90 years or more in dying from its effects." Some arsenic eaters have become able to take daily, and keep in usual health, an amount which would kill a man not habituated to its use. Still arsenic kills, and tobacco is a deadly poison.

A mill pond near my dwelling had been drained, much to the indignation of some people who dreaded the results of the exposure of its black, oozy bottom to the surface. But an epidemic of fever and ague had continued for months in the populous village to which the prevalent winds came, soon after passing over this pond. Moreover, the waters were clear, and did not seem stagnant or dangerous, but they were. A family among my former parishioners lived in a house back of which you went up at a slight elevation as you went toward the barn and outbuildings. In the back kitchen or shed was the well or common water supply. Every member of that family in the course of years, had the typhoid fever. You need think of only a few of the things possible to the water they used, to hush your murmurings at the dealings of providence in their multiplied calamities.

So important is sunlight to plant life, we know that plants cannot grow vigorous in the shade. Few of us appreciate its value to human life. We speak in figures of the sunshine in our homes, and it suggests the gleam and gladness that sparkles in the eye and glows on the cheek. And then we put blinds outside and shades inside of our windows and live amid shadows. As a well known result the color keeps in the carpet and fades out of the cheek. "Who is sick in here?" said my friend, a doctor from New York city to a young man at the entrance to a fine and staunch dwelling many miles up the Hudson on the eastern shore. His wife beside him in the carriage asked, how he knew anybody was sick there. After the young man had answered his question, telling of some one very dangerously ill—the doctor pointed out to his wife the location of the house, and the too abundant shade trees, as his reasons for being sure the occupants must be sick in such weather.

Nothing more need be said to intimate that many familiar things are full of interesting importance, because they concern health and life. The relation of cleanliness to godliness applies to our persons, our homes, and their surroundings. The discussions of this convention will, no doubt, give to the attentive hearer many ounces of prevention. Among the essentials of health are open air, pure water, sunlight, and exercise.

"Nor love nor honor, wealth nor power,
Can give the heart a cheerful hour,
When health is lost."

One has said:

"The surest road to health, say what we will,
Is never to suppose we shall be ill;
Most of those evils we poor mortals know,
From doctors and imagination flow."

Still, we are sure that, in all these matters that concern home and health, ignorance is not bliss, nor is it folly to be wise.

Henry B. Baker, M. D., Secretary of the State Board of Health, Lansing, spoke on the subject "Disposal of waste and excreta in Centreville."

Second Session, Thursday, January 15, at 7:30 P. M.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF A LAWYER.

BY WILLIAM SADLER, ATTORNEY, CENTREVILLE.

Mr. President, Ladies and Gentlemen:

In the absence of the speaker named on the program, I am to speak on the "Restriction and prevention of dangerous communicable diseases, from the standpoint of a lawyer." And, in response, I affirm that law is the synonym of restriction and prevention of *all* impurities in every department of society's needs, law abhors diseases and all that produce them; law furnishes ample remedies for damages; and restrains by its writs and mandates any and all dangers to the health of the people of the State. In its abhorrence of all communicable diseases or their causes, the law steps in and restrains the erection of any building, or the carrying on of any business, the effect of which, is to endanger the health of the people. Indeed it defines all such causes of ill health as it finds existing or threatened as nuisances; and abates them by its mandate even at great sacrifice to the individual. The law as applied to mill ponds, low and unhealthy marsh lands, as illustrated in the laws of drainage and health, are familiar illustrations of its abhorrence of dangerous or communicable diseases, and of the exercise of its restrictive power over such to the extent of their absolute prohibition. This power, it has in hundreds of instances exercised as to cess-pools of all kinds.

Indeed I can safely say that no body of men today stand so absolutely opposed to vicious pestilential influences as does the law as represented by the United States Supreme Court. That court but a few days ago set forth the high doctrine that "all objects that demand the application of the maxim—*salus populi suprema lex*—may be prohibited; that the traffic in liquors was not protected by the constitution and laws of this country and might be justly prohibited as a nuisance by the State as a police regulation."

The law is just as high and pure as are the ten commandments and as restrictive and preventive of any legal ill to our people as the Mosaic law was of the morals of the Jews as given to them on Sinai. Therefore, from the standpoint of a lawyer, I insist that law both restricts and, where properly executed, prevents all dangerous or communicable diseases; and goes even higher than this and guards the morals of a community from every form of injury. A standard maxim of the law is, that (to society) there is no wrong without a legal remedy.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF AN UNDERTAKER.

BY FRANK S. CUMMINGS, CENTREVILLE, MICHIGAN.

It seems to me that no calling gives to its followers the extensive opportunites for close observation of the dire results of careless or ignorant exposure to the dangers of disease than that of caring for and burying the dead.

Having all my life been engaged in that calling, and having had many matters of importance and interest forced upon my attention, I shall try to give you a few pages from my own experience. Although unable to discuss the question with the learning of a scientist I may be able to present some facts from a practical standpoint.

I know with many it is popular to scoff at the care and attention given the dead body. It has been the house of the soul and the image of the Creator, and as such is entitled to proper care and disposal. But in its disposal it certainly should not be permitted to endanger the health of the living.

I shall not confine myself to observations concerning communicable diseases, but shall deal with sanitary and health conditions from the general standpoint of a funeral director; this latitude having been given me.

The funeral director is called upon at a time when all the resources of modern medical science have been or should have been exhausted and failed. Death has claimed its own.

Mother Nature is no procrastinator. She has decreed that the instant life ceases, decay begins; and if uninterrupted she resolves the constituent parts of the body into the original elements in quick time.

During the process of decay, unless proper precautions are taken, great danger to the living exists. The slightest inoculation means blood poisoning and frequently death.

We believe that more sickness and fatality is caused directly and indirectly by careless or thoughtless contact with dead bodies, and by the inhalation of poisonous gases exhaling from them, than is generally realized.

Now let us take a case where death has ensued. We are called to care for the remains. We very frequently find them in a small and illy-ventilated room, fetid with the odors of the sick, vessels sitting about containing excreta from the now dead person, and the room crowded with relatives overwhelmed with sorrow and whose systems because of the intensity of their grief, sleepless nights and overwrought conditions are in just the state to invite the invasion of disease.

Perhaps some may think this picture is purely imaginary, but I assure you it is not, as any person of experience can testify. Indeed, it is rather underdrawn than overdrawn, for in addition to this I have frequently seen a bereaved widow, a childless parent, or some other near and dear relative, in a paroxysm of grief fling herself or himself upon the dead and press the lips upon the unresponsive one's, which are perhaps stained with the life blood that flowed from them but a short time before.

Many times have I shuddered at the recklessness displayed. But what can be done? Persons of a cold, stern, temperament will say, "prevent it by force if necessary, but we believe a little reasoning will be sufficient." It would be, if all persons were constituted like yourselves, but they are not, and either course with a person of an excitable hysterical temperament would be a failure; for them death is an enemy who has taken from them all the brightness and joy of life, and the future is thick darkness. Any expostulation or reasoning that life or health is being exposed is more than useless, for it presents the thought of reunion with the departed, and transforms death into a friend, which causes in her utter abandon, a multiplication of the caresses and complete disregard of all precaution. And who would advise force? It would make for the one resorting to it an implacable enemy and require a heart of stone.

Then what shall be done? The best plan is to have some one who has the complete confidence of those mourning; quietly conduct them from the room to some private apartment as soon as possible, after the death has occurred, calming and soothing them by promises of free access to the room as soon as the body has been placed in proper condition.

Then if the person in charge is capable, he will open the windows and permit a free circulation of fresh air for a few minutes, nearly closing them again so the health of the workers shall not be endangered. Then the body should be thoroughly cleansed and rubbed dry, removing all the death sweat, which is nature's first step toward decomposition, and which is in itself a dangerous poison. Then wash with some thorough disinfectant and carefully permit a quantity of it to find its way through the mouth into the stomach, disinfecting its contents and thereby preventing the escape of poisonous gases. To this treatment will be added other treatment not necessary to explain here.

Having attended to the dead, next the attention should be given to the room. Have all the bedding, clothing and chamber furniture removed and give directions for its proper ventilation, and in cases of communicable diseases, disinfection; and where the articles are of a nature to require it, insist upon their being at once destroyed or buried, giving fire the preference. Having all excreta buried in an unfrequented place, far away from any possible communication with water ways or wells.

Then with some good disinfectant spray the carpets, the ceiling, the walls and the curtains and hang cloths saturated with the disinfectant about the room. Be very thorough, and from a long experience, I have no hesitation in saying, a child may with impunity be taken into that room and be permitted to see and touch the remains, even tho' diphtheria may have been the disease. I know many will take issue with me on this but I know it may be safely done, although I would be far from advising it, on the principle that prevention is better than cure.

Having done all this, the relatives may be given free access to the room again. Kissing the dead is a dangerous practice, but if it is now indulged in, nine-tenths of the danger has been removed by your thoroughness. I have known instances where a breaking heart has been soothed and comforted by such a caress and serious results avoided. Next the funeral director should care for his own person and see that his garments are so treated as to make it safe for him to again mingle with the public.

Right here while speaking of the care of the dead, I cannot refrain from entering a plea for modern embalming. There is no mutilation or

horror about it. It is on a par with the civilization of the 19th century. I believe that from a sanitary standpoint, it marks an epoch in the care of the dead. I know many rail against and denounce it but you will pardon me if I say they belong to the class who believe medicine a fraud, and physicians impostors; who believe in retrogression rather than progression. Modern embalming kills the germs of disease and prevents the spread of contagion entirely. This is a fact easily proved, but which I have neither the time nor ability to discuss.

No more hesitation (nor as much) should be felt in placing the remains of our dear ones in the care of a reputable, capable funeral director, than you have of intrusting their health to a capable, reputable physician, and his instructions and advice should be as carefully followed.

And now permit me to refer to a case in my father's experience where these instructions were not followed. He found the remains in the pantry, on a board which had done service as a cupboard shelf, one end of which was on a shelf and the other on the family pork barrel. The sanitary conditions were not good.

I desire to call your attention to a few reforms in funeral customs, sadly needed, it seems to me; the custom, which I am glad to say shows signs of decadence, of opening the casket at the church. I believe it is usually in bad taste and frequently from a sanitary standpoint, dangerous. Often the public service has been preceded by a long ride in a close hearse, which, because of its glass sides, is a veritable oven. The heat and the jolting disturb the conditions and cause the release of poisonous gases upon the opening of the casket. If the body has been embalmed this danger does not exist. Besides it is frequently a great strain upon the tense nerves of the sorrowing relatives, to be made the target of a hundred pairs of eyes passing in file before them.

The practice of removing the hat during the burial service, and that of expecting or requiring relatives to stand unprotected upon the damp ground should both be abandoned. I believe that the mere raising of the hand to the hat is as expressive of respect and sympathy, as is the present custom. Burial services should be as short as possible, especially in unpropitious weather. Upon this very point I found yesterday an article in one of our papers which I quote:

CRUELTY OF FUNERALS.

"Attending the burial of Lady Rosebury, Wednesday, Mr. Gladstone explained that he found it necessary to practice unusual precaution when assisting at a burial service. 'Many an old man,' he said, 'takes his death attending funerals.'

"He might as truly have said that many a young life is sacrificed to the Moloch of conventionality that requires or allows the burial of the dead to be made an occasion of cruel infliction upon the living. In the British islands only men attend interments. This at least is more humane and more rational than the custom in this country of having all the members of a family bereaved, share the distress that is inseparable from the deposit of the remains of the beloved dead in the grave. Cemeteries and vaults are necessarily dangerous to health, and the time taken for decorum of interment and the ceremonies that usually invest it with pious solemnity, exposes persons already reduced in vitality by grief to peril of cold and exhaustion at a time when there should be a careful nursing of strength for the new demands that sorrow and responsibility make.

"Any custom intended to do honor to the dead which requires the exposure of the health of the living, is a false and mistaken idea of respect.

"Custom is cruel to the living in its funeral proprieties. It adds nothing to the esteem in which the dead are held and cannot assuage in the least the pain that is caused by their passing away. Humanity and right reason alike demand that burials shall be private; that only the few chosen by those directly interested shall attend them,

and that the weaker members of a suffering family shall be induced to remain away from a spectacle that is heartrending, but which they cannot soften by their presence.

"The inhumanity of permitting the weak and the bereaved to suffer the wholly useless torture that must always accompany the echo of clay upon the coffin, will gradually have the effect of making cremation desirable as rapidly as it becomes convenient. It is in every respect the worthier mode of disposing of the poor remnants of flesh that survives dissolution only to be consumed by worms if placed in the ground. It would end many of the dangers that attend burials. It is more cleanly, more sanitary, more soothing, if only the survivors of the dead can bring their imagination so to believe. While interment remains the general mode of disposing of the dead, religion and reason should combine to rob it of cruelties it now imposes upon the living."--*Chicago Herald.*

Our business necessarily frequently calls our attention to the evils arising from our cemeteries. I do not care to dwell long upon this point, for we have right here object lessons of the two extremes in the old and new cemeteries. Although the old cemetery has not yet occasioned any known serious results yet we may expect that it may sometime. We believe the Prairie River Cemetery is most fortunately situated and reduces the evils of cemeteries to the minimum, upon which we congratulate its owners, the citizens of Nottawa township.

But cemeteries will always be objectionable from a sanitary standpoint, and we believe that the growing knowledge of the people upon this point will in time result in the abolition of the present system and the substitution of cremation. I know we now shudder and shrink from the course that suggests; but my friends, if you had witnessed one or two disinterments and the ghastliness and horror of the scene, cremation would seem beautiful and desirable by contrast. I believe no sanitary objection can be raised against cremation. There are many other matters which I have observed to which I would like to call your attention, but time will not permit.

THE RESTRICTION AND PREVENTION OF DANGEROUS DISEASES.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING.

Mr. President, Ladies and Gentlemen:

One of the first questions suggested by the subject assigned to me is—What diseases can be restricted or prevented? So far as relates to the class of diseases the answer is easy,—the diseases which can be restricted are those which are *communicable.* The "communicable" diseases include those which are contagious, those which are infectious, those which in any way are communicated or spread from one person to another,—such diseases as small-pox, scarlet fever, diphtheria, measles and whooping-cough.

Then an important question is, whether any of the most dangerous diseases which have not heretofore been considered communicable do really belong to that class, and can therefore be restricted or prevented. To this question we can now answer yes. At least one of the most dangerous of all diseases, namely, consumption, has, in recent years, been found to be a communicable disease, and a preventable disease.

There is considerable evidence now tending to prove that pneumonia is a communicable disease, and that probably many deaths from that disease could be prevented by the general adoption of measures which recent investigations have revealed.

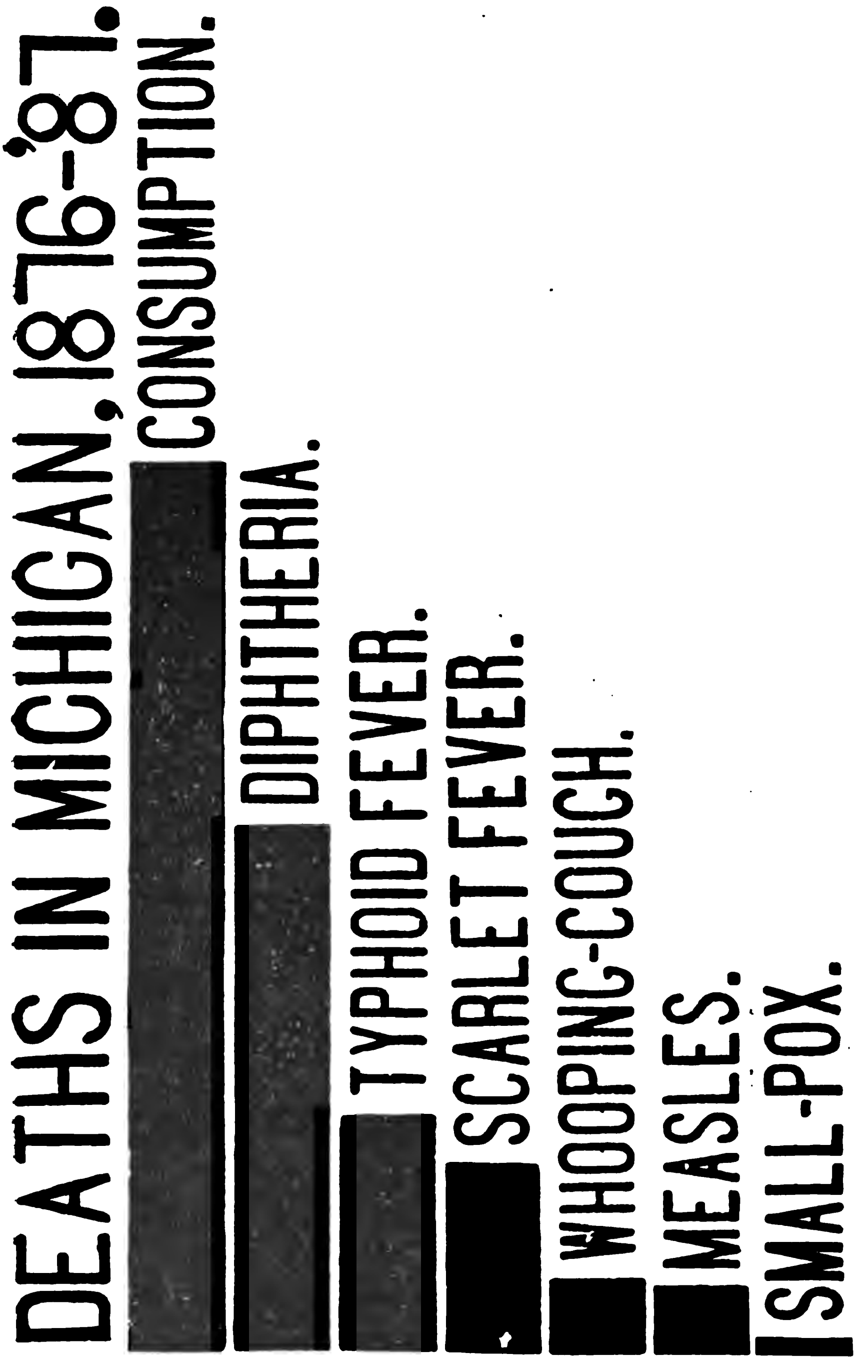
THE IMPORTANCE OF THIS SUBJECT.

The importance of the subject of the restriction of the dangerous diseases cannot easily be estimated. Let us see what aid the vital statistics can give us. The statistics of deaths in Michigan are not perfect, but the relative importance of the several diseases is probably shown with approximate accuracy. The diagram which I exhibit, and copies of which are distributed in this audience, is accurately drawn to scale and correctly represents the deaths reported to the Secretary of State.* This diagram shows the relative importance of the several dangerous communicable diseases. It shows that in Michigan every one of the diseases named in the diagram is much more important than small-pox, as a cause of deaths, and that when compared with diphtheria and especially when compared with consumption, small-pox is insignificant, or at least that it was so during the twelve years 1876-87. If the diagram included pneumonia, that disease would appear between "diphtheria" and "typhoid fever," and then *the five diseases which cause most deaths in Michigan* would be shown in the diagram. The five diseases which cause most deaths in Michigan, named in the order of their importance, are:—consumption, diphtheria, pneumonia, typhoid fever, and scarlet fever.

We thus gain some idea of the vast importance of this subject,—the restriction and prevention of the dangerous communicable diseases, which include all the most important causes of deaths in Michigan. Especially do we appreciate the importance of this subject when we consider that we absolutely know that a large proportion of the cases and deaths from the most of these diseases are *preventable*, and I believe that this is true of all of these diseases.

---

* The diagram "Deaths in Michigan, 1876-87," is printed on page 12.



This diagram is accurately drawn to a scale, and the *relative importance* of each disease, as a cause of deaths in Michigan, is, therefore, correctly shown.

COÖPERATION NECESSARY FOR THE RESTRICTION OF DISEASES.

For their prevention, however, it is necessary that all the people shall coöperate. No one can fully protect himself so long as others do not understand the subject and act accordingly. Therefore, the only way these most important causes of deaths can be most completely avoided by any of us is by increasing the proportion of the people who know how to restrict and prevent them. If we except small-pox, which may, by vaccination, be avoided by each person for himself, this statement is true relative to each of the dangerous communicable diseases,—for the restriction of each there is required general diffusion of knowledge, and general coöperation of all classes of people. That is a good reason why "the restriction and prevention of the dangerous diseases" is given so prominent a place on the program of every Sanitary Convention.

HOW THESE DISEASES ARE SPREAD.

But these diseases are not all spread in the same way; and it is necessary that the people generally shall know how each one is spread, in order to know how to restrict each disease. In each disease, something goes, from a sick person, which is capable of causing the disease. It goes from that part of the body in which the disease is located, and generally it thrives best when it reaches that same part, in the body to which it goes. In consumption that part is generally the lungs; and the specific cause of consumption goes out with the sputa, and is scattered about not only wherever the moist sputa goes, but also wherever the dust from the dried sputa goes. And as the dust of the air is breathed in with the air inhaled, there is opportunity for the specific cause of consumption to go at once to the part of the body in which it is usually found.

This indicates what is the most important measure for the restriction of consumption, namely, the *destruction or disinfection of all sputa from every consumptive person.*

TYPHOID FEVER.

Typhoid fever causes about ten times as many deaths in Michigan as small-pox does,—probably about one thousand deaths per year—and most of these deaths should be prevented. The greatest number of deaths from typhoid fever is of persons in the prime of life, and this should prompt to greater efforts for the prevention of this disease.

The most common modes of spread of typhoid fever are not the same as of small-pox and consumption, consequently the measures for its restriction and prevention are not the same. The pamphlets on this subject issued by the State Board of Health, and freely distributed here, contain plain directions how to prevent typhoid fever, and how to restrict its spread. It is now believed that typhoid fever is most frequently spread by means of the drinking water, that the microscopic cause of the disease is probably reproduced in the bodies of persons who have the disease, and that this specific cause gains access to the drinking water by filtering through the soil, and sometimes by being washed into wells or streams from which the drinking water is drawn. The noted instance at Lausanne Switzerland, where the discharges from typhoid fever patients were thrown into a small stream, which disappeared by sinking into the earth and

gravel, and reappeared about a half mile distant as a mountain spring, the clear water of which caused typhoid fever in 144 persons, is instructive, and is useful for us to hold in mind as illustrative of how the disease may be spread. The most usual mode of spread is probably by way of the privy vault and the neighboring well. The facts concerning the outbreak at Lausanne prove (and the same has been indicated in other instances) that the cause of typhoid fever sometimes passes great distances by way of the underground water flowing through strata of gravel. We must not forget, however, that typhoid fever may be spread through the air, that the supposed "germ" of the disease is not destroyed by once freezing, and is not yet known to be destroyed by ordinary drying. We know that the microscopic germ of consumption is most dangerous when dried and floating in the air we breathe. It may be that the specific cause of typhoid fever is dangerous in the same way.

The prevention and restriction of typhoid fever requires the disinfection of all bowel discharges from those sick with such disease, and constant watchfulness of the sources of supply of water for drinking and culinary purposes. All water from a suspected source should be boiled before its use. Numerous instances are reported where typhoid fever has been spread by the rinsing of milk cans with water apparently pure but really infected with the germs of typhoid fever, capable of infecting the milk. This teaches us the importance of having water free from typhoid infection for all household purposes.

Typhoid fever is a disease which, in my opinion, it is important that citizens of Centreville should understand, because of the nature of the soil and earth underlying this place, and the surrounding country from which your milk supply comes. Sooner or later there will come a time when no ordinary well in such a place as this can be safely relied upon to supply water free from the cause of typhoid fever.

But the general water-supply of cities and villages is a matter of the greatest concern, and it should be procured from places where there can be no probability of immediate or remote contamination. The well-known outbreak of typhoid fever at Plymouth, Pa., where over a thousand cases and 114 deaths occurred, is apparently an illustration of how great a calamity may follow the fouling of a general water-supply by the specific cause of typhoid fever.

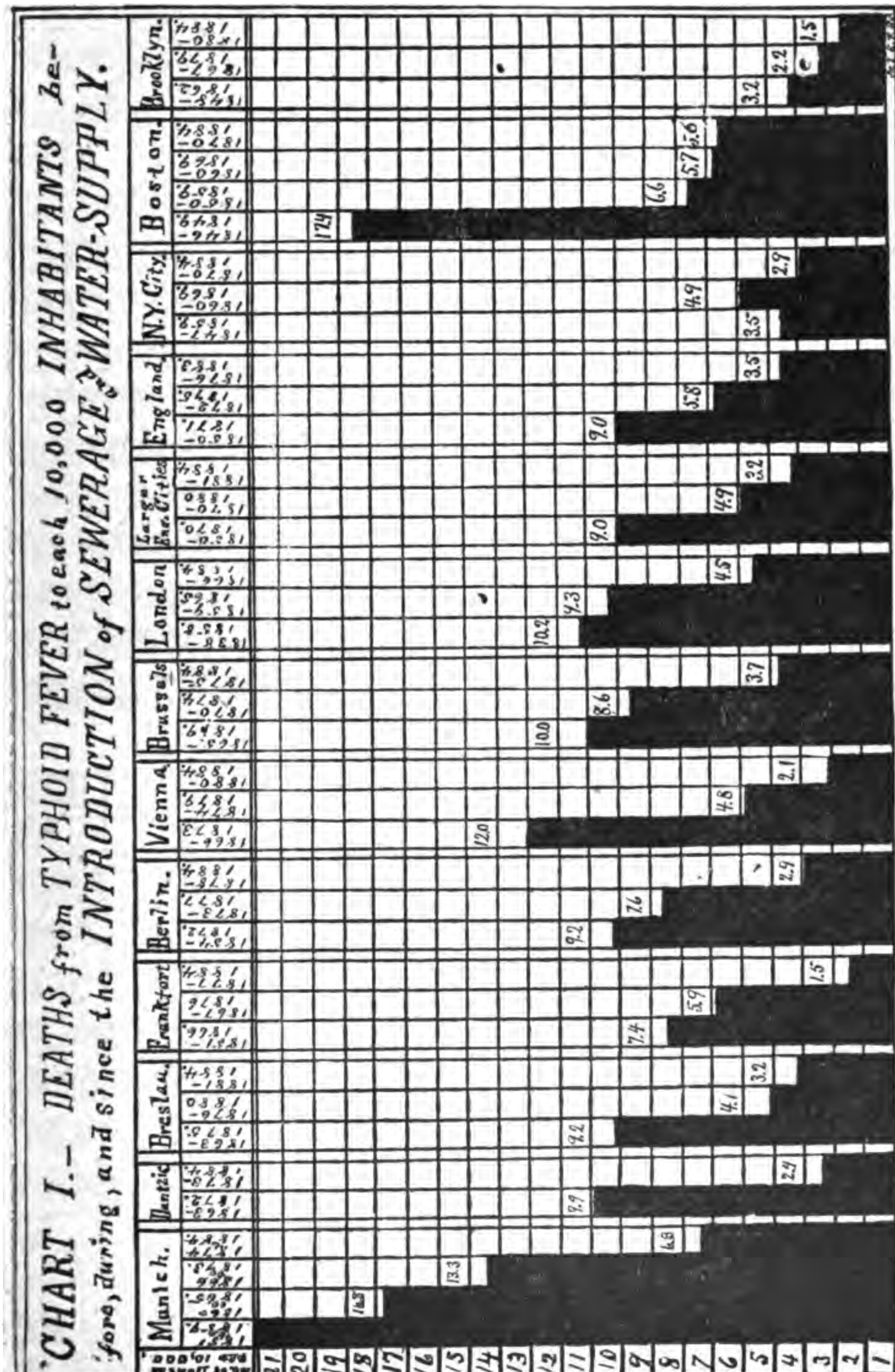


CHART I.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS before, during, and since the INTRODUCTION of SEWERAGE & WATER-SUPPLY.
Munich.
Dantzic.
Breslau.
Frankfort.
Berlin.
Vienna.
Brussels.
London.
Larger Eng. Cities.
England.
N.Y. City.
Boston.
Brooklyn.

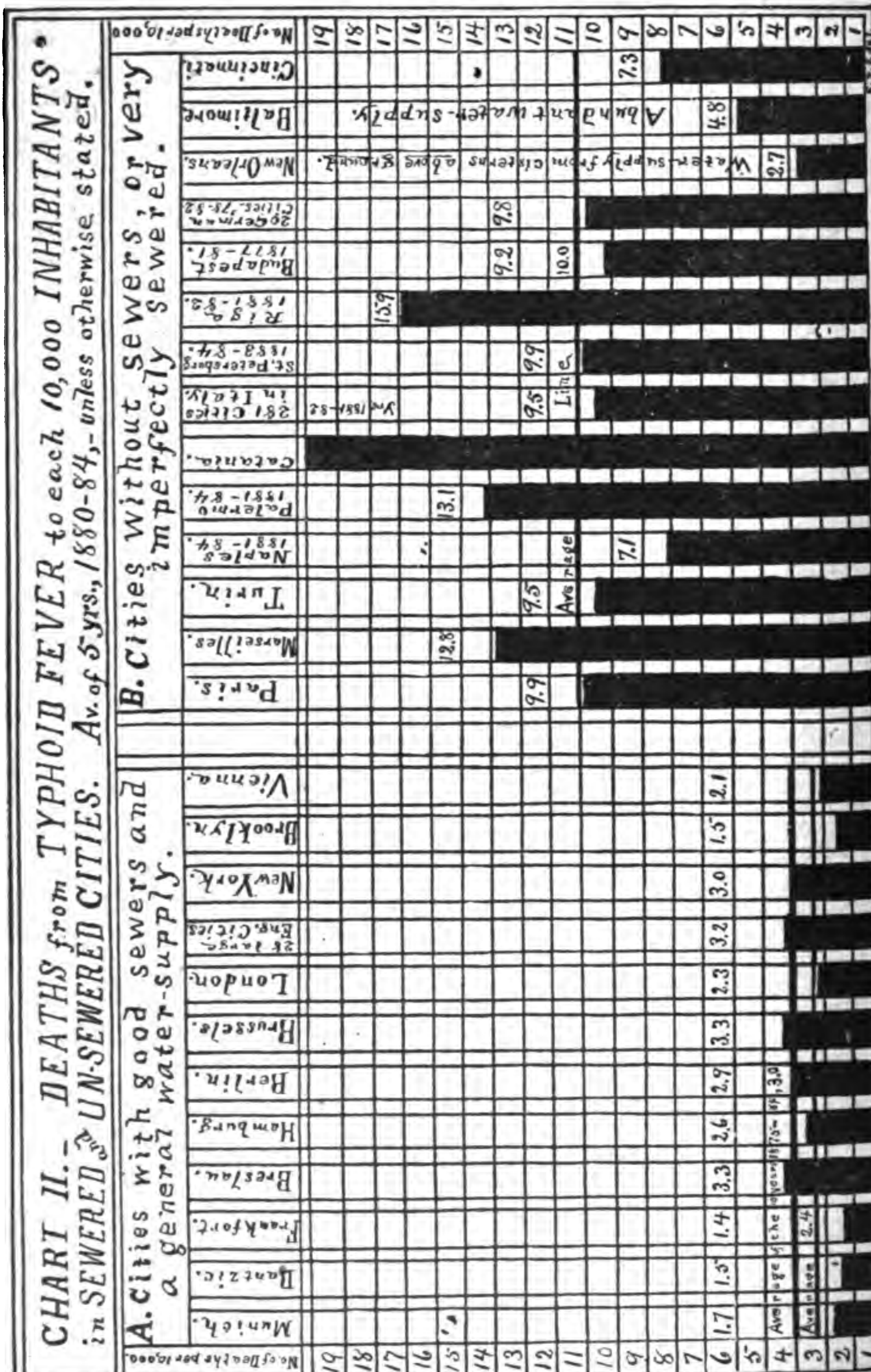
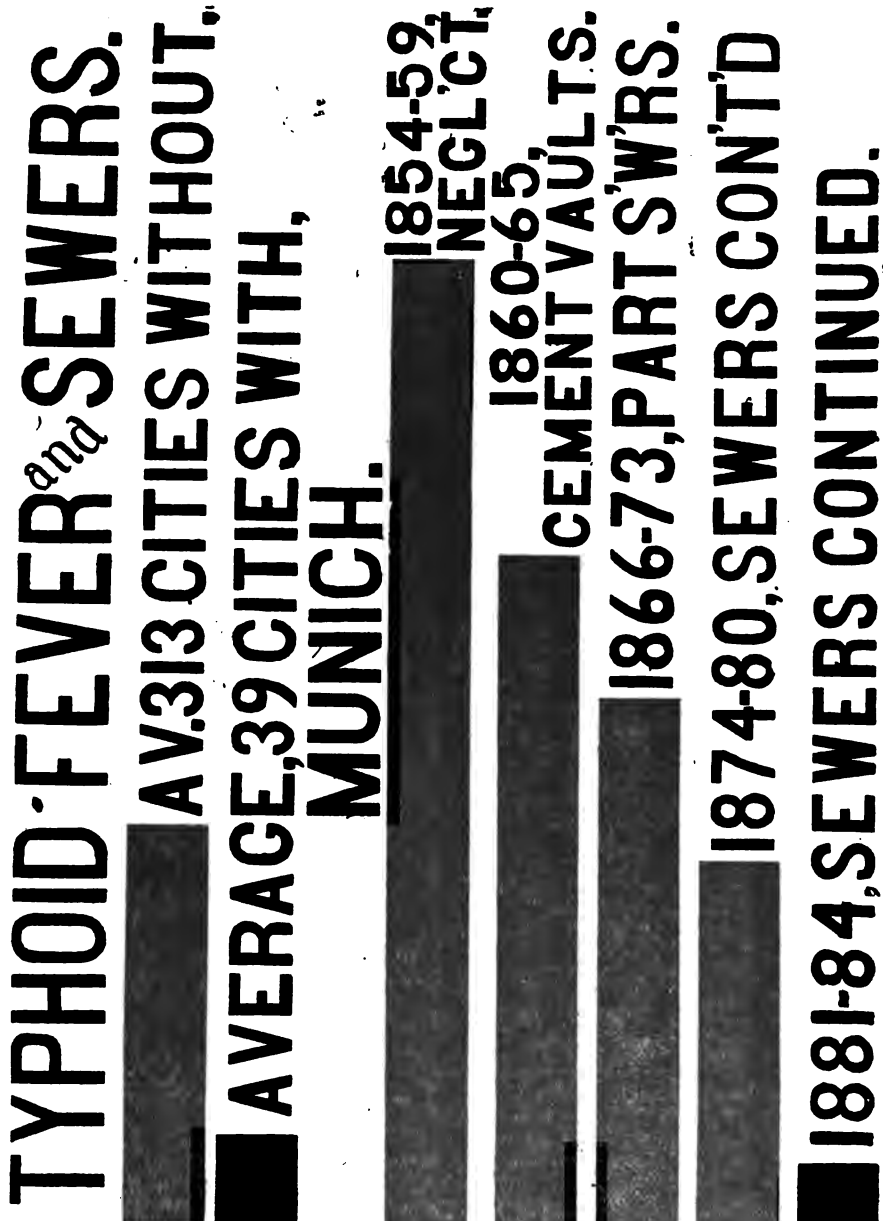


CHART II.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS*
in SEWERED and UN-SEWERED CITIES. Av. of 5 yrs., 1880-84,— unless otherwise stated.
A. Cities with good sewers and a general water-supply.
B. Cities without sewers, or very imperfectly sewered.
No. of Deaths per 10,000.
Munich. 1.7
Dantzic. 1.5
Frankfort. 1.4
Breslau. 3.3
Hamburg. 2.6
Berlin. 2.9
Brussels. 3.3
London. 2.3
25 large Eng. Cities 3.2
New York. 3.0
Brooklyn. 1.5
Vienna. 2.1
Average
Average of the above 2.4
Paris. 9.9
Marseilles. 12.8
Turin. 9.5
Naples 1881-84. 7.1
Palermo 1881-84. 13.1
Catania.
281 Cities in Italy. 9.5
St. Petersburg 1883-84. 9.9
Riga 1881-83. 15.9
Budapest 1877-81. 10.0 9.2
20 German Cities '78-82 9.8
Average Line
New Orleans. 2.7
Water-supply from cisterns above ground.
Baltimore. 4.8
Abundant water-supply.
Cincinnati. 7.3



There is not time at my disposal to give all the evidence proving the enormous saving of human life from the ravages of typhoid fever which in recent years has been accomplished because of such knowledge as this to which I have just alluded; but I wish briefly to refer to some of this evidence. In a pamphlet published by the Michigan State Board of

Health, and entitled "The Influence of Sewerage and Water-Supply on the Death-Rate in Cities", Mr. Erwin F. Smith, shows conclusively very great reductions in the mortality from typhoid fever in many of the great cities in this country and in foreign countries, the reductions in the typhoid mortality following the introduction of systems of sewerage and general water-supplies. For instance, in the city of Munich the death-rate from typhoid fever in the period from 1854 to 1859 was 24.2 per 10,000 inhabitants, while in 1884 it had declined to 1.4 per 10,000 inhabitants; that is, before the city was sewered, and while it was supplied with water from wells, the mortality from typhoid fever was about seventeen times as great as it was after the city was well sewered and had a good general water-supply.

To give you a mental image of this important subject, I have had copies made of two diagrams prepared by Mr. Erwin F. Smith to illustrate his paper, and they are here for distribution to such of you as will study them.*

Details relative to the decrease of typhoid fever, in Munich, are more graphically shown in the diagram "Typhoid Fever and Sewers," (printed on page 17).

If there should be in Michigan such a reduction of the mortality from typhoid fever as was secured in Munich through better sewerage and water-supply, there would be a saving of over nine hundred lives per year, and over nine thousand cases of sickness per year. To point out how such favorable conditions for healthful existence may be secured, is one of the objects of such Sanitary Conventions as this.

Let us pass now to the consideration of diseases which are fatal chiefly to children.

Diphtheria.

About eighty-five per cent of all the deaths from diphtheria are of children under ten years of age. Grown people have diphtheria, but it is usually considered as only an ordinary sore throat, and proper precautions to prevent the spread of the disease are not taken. This ought to be generally known, and many more lives can be saved when all our people come to understand the facts.

In Michigan diphtheria causes about seventeen times as many deaths as small-pox does.

Diphtheria is prevented by keeping away from where the disease is, and from everybody and everything that has been near the disease; keeping away until everything has been disinfected. In order that this shall be possible it is essential that every place where diphtheria is shall be promptly reported to the health officer, and plainly placarded. The law requires the local board of health to "give public notice of infected places," and to "use all possible care to prevent the spreading of the infection." Another law requires the health officer to "give public notice of infected places by placard on the premises, and otherwise if necessary." Common humanity requires of every person that he do his utmost to fulfill the letter and spirit of all such laws for the public safety against such a terrible disease as diphtheria.

But however good the laws may be, their execution depends upon the

* These diagrams are printed on pages 15 and 16.

enlightened public sentiment of the locality, upon the people themselves, from whom the prompt notice should go to the local health officer, and upon intelligent and faithful local officers who should perform duties which are of the highest importance to the people.

Scarlet Fever.

Scarlet fever is a disease to be dreaded on account of the mortality which it causes and also on account of the permanent injuries which result from it. Thus, as an instance, of 263 pupils in the Michigan State School for the Deaf, at Flint, during the years 1887-8, who became deaf since their births, the loss of hearing of 16 per cent is attributed to scarlet fever.*

Of the 114 pupils in the Michigan State School for the Blind, at Lansing, during the two years, 1887-8, who became blind since birth, 6.1 per cent lost their sight from the effects of scarlet fever.†

In Michigan scarlet fever causes about nine times as many deaths as small-pox does. The only ***preventive*** is to keep away from the disease, and to allow no person or article infected with the scarlet fever contagium to come near a person susceptible to that disease.

For its restriction, except that there is no vaccination, all the measures proper in the case of small-pox are proper in scarlet fever.

Inasmuch as scarlet fever causes nine times as many deaths as small-pox does, the importance of prompt notice to the health officer is at least nine times as great as it is in small-pox.

All the other measures should be promptly and thoroughly executed. I will not stop to give you details. They are published in our pamphlets, here for distribution.

Practical Results in Restricting Scarlet Fever.

At the close of the year 1887, the statistics published by the State Department showed that the mortality from scarlet fever in Michigan had been reduced in the years when the measures recommended by the State Board of Health had been to some extent fulfilled, so that over five thousand six hundred persons had lived who under the old mortality rate, before the Board began its work, would have prematurely died. This is an average saving of four hundred lives per year—rather more than a life every day for fourteen years—saved from that dread disease, scarlet fever.

But we have other evidence than the mortality statistics, showing the great saving of life which it is possible to have in Michigan through such measures for the restriction of scarlet fever as I have briefly outlined. The experience of the local health officers in restricting scarlet fever in this State is reported each year to the State Board of Health; and a compilation of these reports shows that in those outbreaks in which isolation and disinfection were neglected there were about five times as many cases and about five times as many deaths as in those outbreaks in which they were enforced.‡

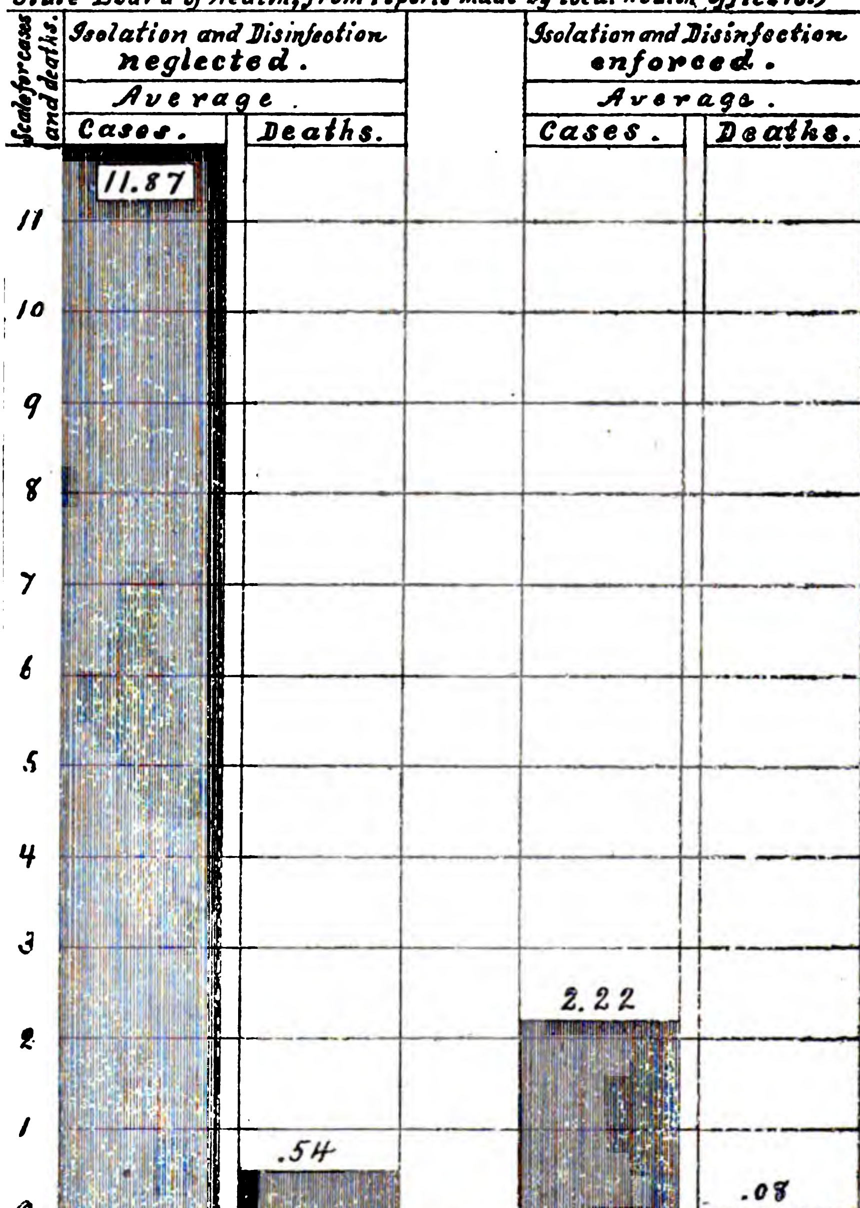
This is about equivalent to saying that four-fifths of the cases and deaths from scarlet fever are known to be preventable through measures which we can describe in three words—*isolation and disinfection.*

---

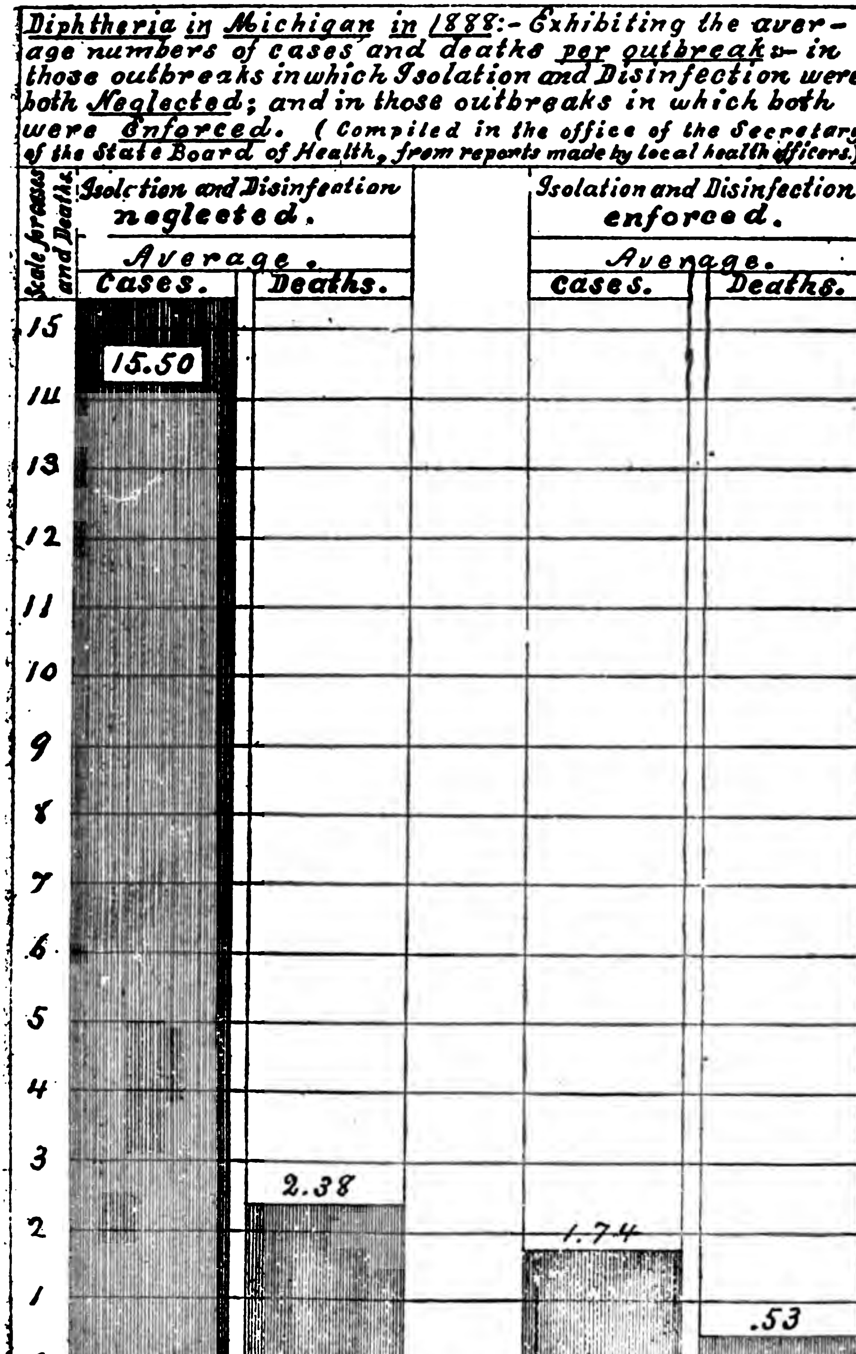
* Eighteenth Biennial Report of the Board of Trustees of the Michigan School for the Deaf.
† Report of the Superintendent of Public Instruction, Michigan, 1888, pages 78-80.
‡ The evidence for one year, 1888, is shown in the diagram printed on page 20.

ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.

Scarlet Fever in Michigan in 1888:—Exhibiting the average numbers of cases and deaths per outbreak:— in those outbreaks in which Isolation and Disinfection were both Neglected; and in those outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



ISOLATION AND DISINFECTION RESTRICT DIPHTHERIA.



Practical Results in Restricting Diphtheria.

While on the subject of the saving of life in Michigan, I may mention that the experience of the health officers in restricting diphtheria in this State is also reported each year to the State Board of Health, and a compilation of these reports shows that 833 lives were saved and 4,374 cases of sickness prevented from diphtheria in Michigan during the year 1886, and that in the year 1887, 518 lives were saved and 2,371 cases of sickness prevented; during 1888, 416 lives were saved and 3,292 cases prevented. Thus, during the three years, 1886, 7 and 8, over ten thousand (10,037) cases of sickness were prevented, and more than seventeen hundred (1,767) lives were saved from diphtheria in Michigan. Or, another way of stating this is to say that during the last three years the *known* saving of life in Michigan from diphtheria has averaged one and a half persons per day.*

Practical Results in Restricting Small-Pox.

The statistics collected and published by the Secretary of State of Michigan, taken in connection with the facts on record in the office of the State Board of Health, prove that in Michigan, through such measures as I have outlined, the mortality from small-pox has been reduced, and that if it had continued at the same rate as before the State Board of Health was established, more than one thousand five hundred persons in Michigan *would* have died from small-pox that have *not* died of that disease. This was true at the end of the year 1887, and since that time the mortality from small-pox in Michigan has not increased. The statistics now cover so many years that we think there can be no doubt of the reliability of their evidence.

The success which has already been achieved in dealing with scarlet-fever, diphtheria, and small-pox should encourage all to more thoroughly coöperate for the restriction of those diseases, and also to enter vigorously upon the work of restricting typhoid fever and consumption. The relative importance of these diseases can be seen by the diagram which is exhibited here.† I believe that one hundred lives per year have been saved from death from small-pox. The diagram is accurately drawn to scale, and correctly represents the relative mortality in Michigan from these important diseases which we believe are largely preventable. You can see for yourselves how much more important than small-pox some of the other diseases are, and the tremendous opportunity which there is for life-saving work for the restriction and prevention of the dangerous communicable diseases in Michigan. I do not see how one can have a better field or a nobler work, and I trust we shall all do what we can in this direction.

---

*You may be interested to know the method of estimating the number of cases prevented and lives saved by means of isolation and disinfection. It is as follows: Multiply the *whole number* of outbreaks by the average number of cases and deaths in the *neglected* outbreaks, and the product is the probable number of cases or deaths which would have occurred if *all* outbreaks had been neglected. Deduct from this the number or cases or deaths which actually occurred, and the remainder is the indicated number of cases of sickness prevented or lives saved by the efforts made to restrict the disease.

As the local health officers report to the State Board of Health the number of cases and deaths in the out breaks of diphtheria, and also report just what was done (in each outbreak) to restrict the disease, we are thus supplied with the data necessary to learn the success which attends any line of action which is taken. [The diagram on page 21 exhibits graphically the experience in restricting diphtheria in Michigan in 1888.]

†This Diagram is printed on page 12.

Third Session, Friday, January 16, at 9:30 A. M.

Arthur Hazlewood, M. D., member of the State Board of Health, Grand Rapids, gave an unwritten address on "The Relations of Privies and Cess-pools to Wells." No stenographer being present, the address cannot be reproduced.

THE RELATION OF PRIVIES AND CESS-POOLS TO WELLS.

DISCUSSION, BY EDWIN STEWART, M. D., MENDON.

I confess to having hydrophobia, I am afraid of well water in villages, because I believe it contains organic matter that is unhealthful and unclean. The simple statement of the subject for discussion is enough to turn one's stomach. Think of it! "The relations."

Now the source from which all our well water comes is from the ground water, or rainfall, that has run over or filtered through the soil or earth, which is saturated with filthy cess-pools and honey-combed with privy vaults. It is a mistaken idea that some people have that *their* well is supplied by a vein or stream. As a rule, the depth of all wells, to the top of the water, is about the same from a common level. No crotched limb of peach tree or hazel brush can find water at any other level in this country. This ground water is like an underground lake, and is nearly as free to move in any direction as in a lake not covered with twenty feet, more or less, of sand and gravel. A veteran well-digger says that while working in a newly bricked up well, four rods from a drive well on the opposite side of the house, he could see the water move at his feet with every stroke of the pump handle of the drive well.

This water moves then; and, although there is a slow current towards a lower level, it is easily turned laterally from a direct course by a vacuum, or any disturbance of the current. So then our bucket, or pump, may bring nearer to us the contents of all our neighbors' leachings.

But water going down from the surface, cess-pool or vault, does not always go straight down to the underground lake, but it makes for the nearest lower water level. A gentleman rebuilding after a fire, while excavating to enlarge an old cellar, unearthed an old cess-pool or slop hole. He found a line of discolored greasy earth, leading downward and to the northeast, toward the bottom of a well two or three rods distant, although the current of the ground water is toward the south. We must not flatter ourselves that all the filth about the back yard, is going directly to the lake or river, or straight down to the current; but, if there is a well near, it will make straight towards it.

Almost every village lot has two important institutions, a vault and a well, what is to hinder a communication? Nothing but some loose sand and gravel, which are not a hindrance. The well cannot go to the vault for it is deeper; but the vault may go—*must go*—to the well, and the deeper the vault, the easier to go to the well. I have known these two institutions so nearly together in two instances that their proximity could be detected by the smell of the water from the wells. But there is an easier way to demonstrate these impurities. Alum is used to cleanse water for mechanical purposes, then why not to detect these impurities? It curdles, or precipitates the organic matter, which then settles to the bottom. Try it. Take two clear glass bottles, of about four ounces capacity each,

fill one with water from your well, the other with pure rain-water, and mark them. Add a piece of alum to each, large as a kernel of wheat or corn and set them away over night. You will find in your well water a sediment that would spoil your breakfast if you should even think of drinking it. Now *too much*—how much?—is known to cause sickness, protracted fevers, and, it is my belief that a large share of mysterious maladies and indispositions for which no known cause has been assigned, are caused by the impure water we drink. And the evil will go on increasing as the village grows older, and the surface earth becomes more and more saturated and more unfit for a filter.

Then the cess-pool and the vault or the well must be—will be—abandoned. Which shall it be? The short and easy way is to abolish, annihilate the cess-pool, and supersede the abominable nuisance—the vault, by the inodorous and more cleanly and convenient earth closet.

THE RELATIONS OF PRIVIES AND CESS-POOLS TO WELLS.

BY WILLIAM SADLER, ATTORNEY, CENTREVILLE.

Mr. President, Ladies and Gentlemen of the Convention:

This metropolis of St. Joseph county is one of the most beautiful villages in this commonwealth; its people are certainly as intelligent and healthy as usually falls to the lot of the most favored residents of a "shore town"; its churches, schools, and sidewalks are proof of our claims; and yet to this cultured and healthy people I am to speak on this, not most elegant, but most important theme.

Our village is situated on the south side of Prairie river, a half-mile from its banks, on a nearly level bur-oak plain, the surface of which slightly dips to the north. Just south of the town is "the Ashrey pond," a basin covering about seven acres and lying about ten feet below the surface soil of the center of the town. The pond is now nearly dry, but formerly containing water to the average depth of six to eight feet. Just south of this pond the land rises on a slope to an altitude of 50 to 75 feet in three-quarters of a mile, and, on this elevation, there are marshy basins. Still south of these, over on the other side, is a basin nearly a mile long (east to west), containing a lake of water from one to 15 feet deep, the surface of which is about 40 to 50 feet higher than the surface of the land in our town, and is two and a half miles distant.

It is found that the flow of water under our town is to the northwest, from the south or southeast, and runs beneath the surface at an average depth of about 24 feet.

Our soil is a sandy and gravel loam for three or five feet, then the washed gravel is intermingled with nice building sand, for about three feet; then a bed of clear lake sand varying in thickness from three to ten feet, and a porous or loose gravel bed in which our water is found. In no part of our town is any considerable bed or stratum of clay soil found; yet clay is interspersed in the blocks or veins with the sand bed to which I have referred.

The first question that arrests my attention is: will the water from privies and cess-pools percolate through these soils of ours; and, if so, how far may we expect that it will percolate, or flow in these strata? Will the moisture from these cess-pools flow against the dip of these strata and opposite to the general flow of the water bed beneath them? A cor-

rect answer to these questions will, to a great degree, determine the relations of privies and cess-pools to our wells.

I shall first, in answering my questions, insist that the unusually porous quality of our soil is *our* greatest safety against impurities, from these vaults, flowing into our wells, for the reason that their moisture more readily flows down beneath them and the impurities are carried off in the *general* flow; and, unless the direct current beneath one of these vaults strikes a well before it is purified, by its transit through the sand and gravel, no harm arises from it. If more strata of clay existed our danger from these impurities would be much greater, by the additional check to their fluids going down, and the flow from them being more at all angles, and as wells in clay soil would make natural drains or outlets through the clay they would be the direct recipients of the impurities of these cess-pools and act as a drain for any privy or cess-pool near it as the waters search for an outlet downward to its general water level. I assuredly assume, from considerable experience and reading, that water will percolate *all* soils in *all* directions; but in some soils (like ours) more rapidly than in others and more freely *with* than *against* the dip of the strata. Prairie river is as low as our general water flow, and receives it; and thus our impure waters soon pass out of reach of danger, but still cess-pools (which should never exist) are dangerously near our wells and very common; and so are our privies. I insist that a privy vault 20 feet from a well 20 feet deep will, even in our soil, be quite sure to flow to it and contaminate its water. I have seen offensive cess-pools within ten feet of a well. Just back of Campbell's block is a well for the use of the inhabitants of the block; about 12 feet northeast of the well is an old covered vault; a large double privy 20 feet to the northwest and north; a barn, with manure from four horses in larger or smaller quantities all the year, is not over 60 feet distant. Can it be possible that this well can be pure? The waste matters of men, plants, or animals, is poison to its producer; so the effete matter of privies or cess-pools, either received through the air, food, or drink, is rank poison and a propagator of diseases. Therefore this question needs more care by the people in villages like ours, where we have no sewerage or city water supply, than in cities where the city authorities fully provide proper remedies against these evils. Our village authorities should prohibit all cess-pools and all sunken vaults under privies, and compel cemented receptacles, with proper authority in our health officer to see to their cleansing.

Dry dust is the best purifier I have ever known. It is better than lime because it mixes with, and neutralizes the contents of a vault more perfectly than any other clarifier; it is God's everywhere-present remedy to cleanse man's physical impurities. Let it be used freely; and any vault can be cleaned out as comfortably as a barn yard. If God did not do more for our health, than we do ourselves, by his laws of the soils and drainage flows, our villages would be swept off with pestilence every autumn. Let us wake up and do our part in this much neglected duty of preserving the water of our wells from these contaminating impurities, and thereby add to our years, and to our happiness.

I would be glad to get a scientific exposition of percolation in soils like ours, and especially as to fluids from cess-pools flowing against the dip of the soil, and in short a fuller exposition of the laws of percolation than I have yet seen in our State.

THE WATER-SUPPLY OF CENTREVILLE.

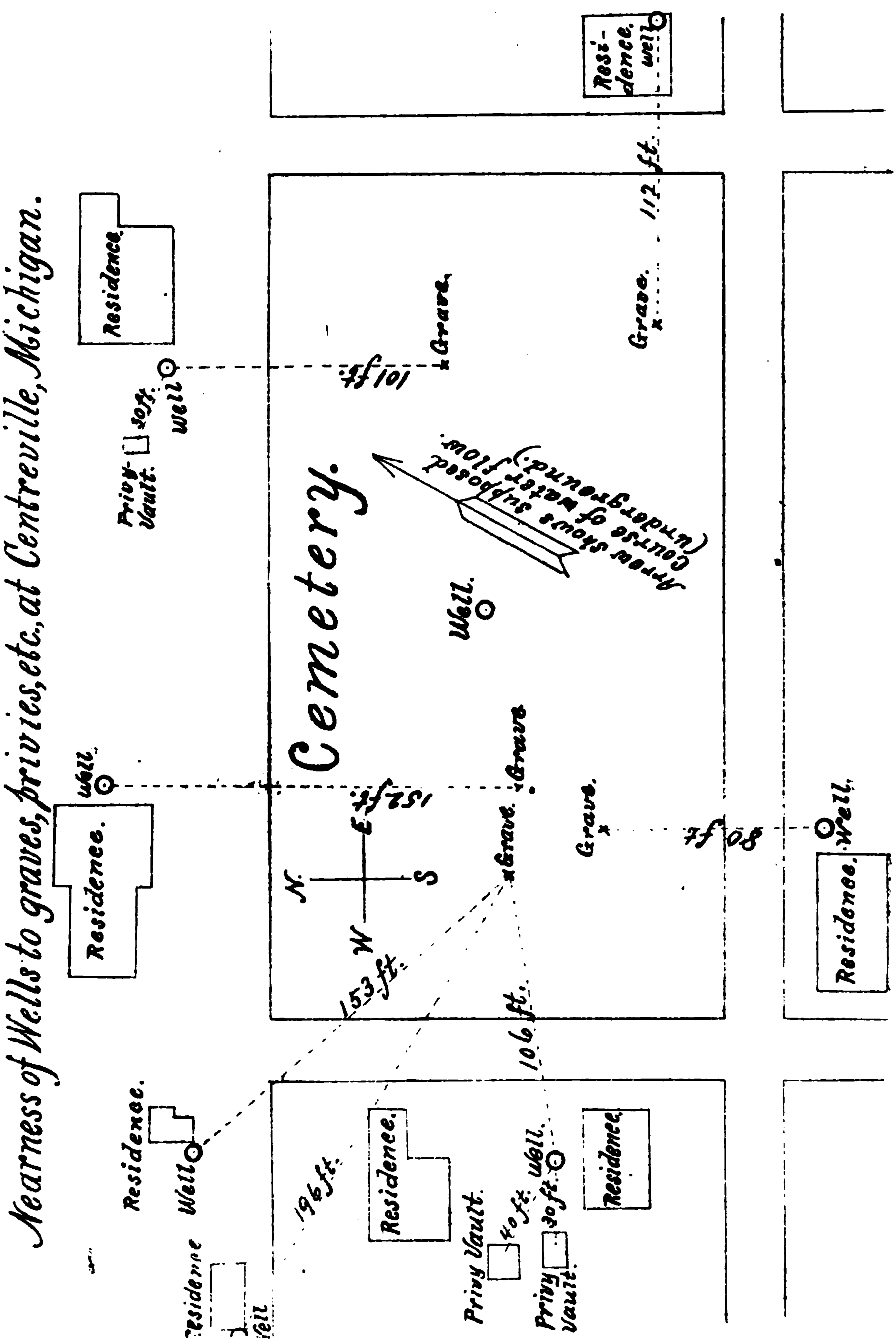
BY L. H. D. PIERCE., M. D., CENTREVILLE.

As I understand the intent of our sanitary conventions, that are being held in the cities and villages of our State, is to present to the people the investigations of the scientist in such a manner that the masses may practically receive the benefits of their labors.

It is well known that there are three things really essential to life, namely: air, water and food. Of these three, water is the one which I wish to present to you. As described by the chemist water is made up of two elements—oxygen and hydrogen. One part of oxygen to two of hydrogen; or, by weight, eight atoms of oxygen to one of hydrogen. In this state of chemical purity, however, it is rarely seen, being difficult to obtain or to preserve. Water as we have it is the pure water of the chemist, more or less contaminated by other substances, varying in quantity to the amount of the refuse water of our homes and manufactories of which we are so anxious to get rid. The quantity of water required by each individual of our race varies with the extent of his desire; but each man absolutely needs, for health, about 60 oz., per day. The human body by weight is composed of from 60 to 70 per cent of it. Not a vital or chemical change could occur without it. The human brain would become as dry parchment, and its activity would cease. There could be no growth, no repair, but all would be death in the absence of this liquid.

Man early recognized the importance of water, and carefully protected its purity, and sought to increase its supply by digging wells, building pools and conduits for it. The Romans erected the finest and most extensive water ways of the world; and, although in ruins today, they remain as monuments to the intelligence of that people. No people can long remain indifferent to the quality and abundance of a thing that is of so much importance to their prosperity, health, and life. The standard of potable water is variously fixed by investigators, but there is a uniform agreement that water should be colorless or transparent to white light, without smell or taste, have no particles suspended in it, and deposit no sediment; yet all this may exist and the water not be harmless. As a rule water is pronounced good if the color, taste, and odor seem satisfactory. To regard clear water as pure water, is a mischievous error; it by no means holds good that impurities may not be present in such water. As the most of our villages depend on private wells for their water supply, a much greater care should be exercised in the location of the same, especially as concerns the nearness to cess-pools, privies, and drains.* Water is one of the best solvents in nature, and will pick up from the earth different organic and inorganic matters, often giving the history of the surface and sub-stratum from its analysis.

* A diagram exhibiting "nearness of wells, graves, etc., in Centreville, Mich.," is printed on page 27. The cemetery has been used for thirty or forty years, and the graves are very numerous and close together. The diagram shows only the distance from the nearest graves to adjacent wells. There are graves, in every instance, nearer the edge of the cemetery than those shown in the diagram.

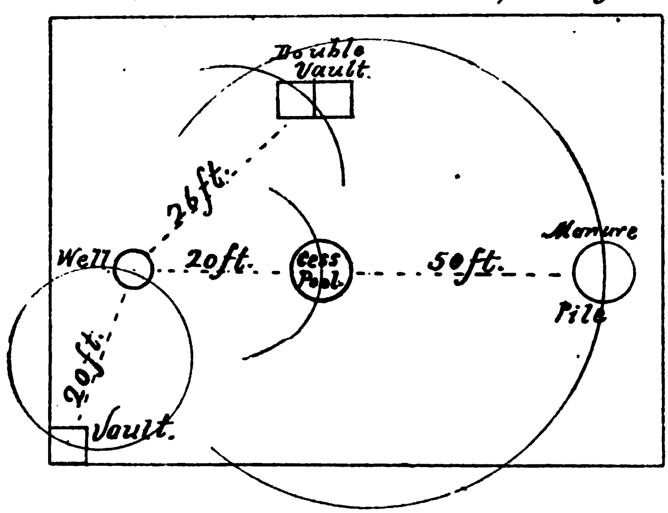


Nearness of Wells to graves, privies, etc., at Centreville, Michigan.

Wells containing bad water are not, I believe, the exception, but the rule, especially in cities and old settled communities. Many regard the

soil as a perfect filter on a large scale; this is a great error. After the soil becomes saturated with chemical impurities, the passage of water through it is much more liable to poison than purify the water. As wells are most always situated in reference to their greatest convenience to the kitchen and barn, only a short time is required for the porous soil in this region to become saturated with scrapings and slops from the kitchen, and sewage from the barn yard and vault.*

A Well at Centreville, Michigan



Sink your vaults in this porous sand, bury the dead, poison the water-shed which slopes from the graves toward your water supply. These very things you can say you have done; and, while your water is yet pure, have you any surety that tomorrow it may not be impure from these causes? Are you positive you are not already using contaminated water?

Centreville has the appearance of being a nice, clean, country village, but like all other places it has its objectionable features. We have a cemetery right in our midst. We have cess-pools, dirty barn yards, and old vaults. We also have wells in close proximity to all these, and sooner or later the water will become contaminated, if it is not already. Our village is supplied from 171 wells, 96 drive and 75 open. The average depth is about 20 feet. The soil through which they pass is mostly sand. The first layer, of about six feet, is yellow sand; the second layer, five or six feet, is white sand; and the third layer is gravel and sand; beneath this sand is clay. But few of our wells reach this layer of clay. The water runs in a north and northwesterly direction. Filtration through such a soil is rapid and we know that sand, of all the components of the soil, stands lowest in the scale as a purifying agent, as it has no chemical action on any of the impurities held in solution.

---

*The diagram exhibiting "A Well at Centreville, Michigan," is printed on this page.

Fourth Session, Friday, January 16, at 2 P. M.

THE GERM DISEASES.

Dr. Henry B. Baker spoke briefly, substantially as follows:

What are the germ diseases? Diseases caused by germs, of course; but what are the names of those diseases? The most important of them are consumption, typhoid fever, pneumonia, diphtheria and scarlet fever. And it is important that we understand that these are the diseases which, in Michigan, cause the most deaths. The importance of this subject is thus proved to be greater than any other subject connected with public sanitation; because the subject of the germ diseases deals with the modes of causation, restriction and prevention of all the diseases which cause most deaths in Michigan.

Prof. Victor C. Vaughan, M. D., Ph. D., member of the State Board of Health, Ann Arbor, gave a carefully prepared address on "The Germ Diseases," and in the course of his remarks described and exhibited cultures of the different non-pathogenic and pathogenic micro-organisms including the germs of about all the important diseases which prevail in Michigan. After the address by Dr. Vaughan, Prof. Delos Fall, M. S., member of the State Board of Health, Albion, summarized the work of the convention.

Fifth Session, Friday, January 16, at 7:30 P. M.

VENTILATION OF SCHOOLS AND PUBLIC BUILDINGS.

BY J. F. BROWN, SUPERINTENDENT OF SCHOOLS, CENTREVILLE.

It is surprising how recently the ventilation of schools and other public buildings, has attracted our attention. We have erected our colleges and churches with a view to every convenience, and left out the prime necessity—fresh air. How many ministers are preaching to sleeping audiences, and how many teachers, are teaching listless classes and all no fault of theirs, but simply because the necessary conditions for attention, thought and mental development are wanting. A school room, or other public building, that is fit to be occupied, should have two essential provisions: (1.) There should be an adequate supply of pure warm air, and (2.) There should be some means for removing the foul air. This should be accomplished without draughts, and should be a continuous process by which the air should be constantly changing.

In building an ordinary single-room district school-house, a good system of ventilation may be secured at small trouble and expense. Let a brick flue be constructed, two by three feet in the clear, and in this flue should be placed an eight inch heavy iron pipe for conveying the smoke. This smoke-pipe should extend two feet or more above the brick flue. The brick flue should extend into the basement and there be connected, immediately under the floor by means of pipes, with two or more registers placed in opposite parts of the room and directly in the floor, being careful not to place them under the seats. These registers should be about sixteen by twenty inches, and should be opened immediately after the fire is started in the morning. When the iron pipe becomes warm it will

cause an upward current of air which will remove the foul air *near the bottom* of the room. The iron pipe should be heavy, both for durability and to prevent the burning of dust in the ventilating shaft by contact with a red hot smoke-pipe.

To get the fresh air in the room is equally simple. If an ordinary stove is used an opening can be made directly under the center of the stove, about twelve by sixteen inches, and fitted with a pipe extending through the basement to the open air—never open in the basement. This pipe should contain a damper that can be opened or closed at will, and so regulate the supply of air to be heated. If this pipe is brought within four inches of the bottom of the stove, and there fitted with a flange extending over the entire bottom of the stove and about two inches up on each side, our ventilating apparatus is complete. Buildings containing more than one room, if not too large, can be ventilated in the same way; and the plan for cheapness and simplicity commends itself to private use.

Where furnaces are used the air is too often taken from the basement, a practice that cannot be too strongly condemned. A recent examination of the fresh-air boxes in the basement of our school building revealed the fact that the openings, through which the boxes were intended to be cleaned, were open; so, instead of the fresh air from out of doors passing up to the rooms above, the vitiated air of the basement, that is used as a play-room, was allowed to pass up.

The same principles apply to buildings of two, three or more rooms. These principles briefly summed up are as follows:

1. Let the room be of ample size. The New York State Board of Health recommends two hundred cubic feet of air-space to each person, providing the air is constantly changed.
2. The foul air should be removed at or near the floor.
3. The ventilating shaft should be large enough to take out the foul air.
4. The ventilating flue should always be heated to be of service.
5. The supply of fresh air should be warmed, and the amount admitted should just compensate that exhausted by the ventilating flue.

Our Centreville school building is a substantial brick structure, containing five assembly rooms. It is heated by steam direct, except the fresh air which is heated by steam in the basement before being admitted to the rooms above. The heat is even and the method of introducing fresh air excellent, with the exception that the supply is too scanty. There is, however, no means provided for removing the foul air. This was thought to be provided for, in the construction of the building, by leaving the wall between the two lower rooms hollow and connected with an opening in the base of the chimney. Registers in the different rooms were connected with the interior of the wall; and it was thought that a sufficient draught would be created in the flue to carry off the foul air. It was found that the opening in the chimney would interfere with the draught of the engine; all of which would be avoided by the plan which I have outlined. It is, however, doubtful whether the size of the present flue would be sufficient for so large a building. I think, however, that if a separate smoke-pipe constructed of heavy iron was placed inside the present flue and extended above as I have suggested, and each room was connected directly with the brick flue, by means of a register, it would be a great help toward removing the foul air.

As the result of some measurements, I find that the fresh air to supply

the primary department, in which are some forty pupils, is brought through a pipe of the enormous size of 2¼ by 2½ inches inside. Think of it, forty pupils breathing through a hole in the wall with an area less than six square inches. Yet that is what the pupils in the two lower rooms are compelled to do, or be subjected to the still more immediate danger of powerful drafts from the windows or doors.

The fresh air to supply the three rooms above is brought to the heating boxes through two pipes 4¼ inches square. A little calculation also shows that the fresh, warm air for all the pupils in the school, some 175, must be brought through openings with an aggregate area of ninety-two square inches. Now, if we allow to each pupil thirty cubic inches of air per minute, and that is a very low estimate, since about double that is estimated to be necessary to secure absolutely pure air, then our 175 or 180 pupils will require 5,400 cubic feet of air per minute. To supply this through the present pipes would require a velocity of 8,640 feet or about 1⅗ miles per minute. How many think such a velocity is secured.

The question of ventilation is one deserving of greater attention than it receives from those in whose charge is entrusted the care and construction of public buildings. We are proverbially careless of the needs of the body for pure air even in our own homes.

Of course there are scoffers who will tell us that this fresh-air craze is merely a mania, a mere matter of habit; and that, because our fathers slept in a seven by nine bedroom and lived to a hale old age, we can do the same thing. These will relate with great glee the story of the man who, finding himself unable to sleep at his hotel, because he had been unable to raise the window in his room, at last arose and tried again in the darkness, and failing, broke a light of glass, after which he had no difficulty in sleeping. Imagine his dismay in the morning to find that he had broken into the glass book-case in the room.

Nevertheless science, before whose decrees we all bow, estimates that forty per cent of all deaths occur through neglect of this sanitary precaution of ventilation in the homes of our citizens. Before we go to Germany in search of the wonderful lymph of Dr. Koch, had we not better secure the life-giving lymph that is at our own doors.

A resolution, offered by Wm. Sadler, favoring legislative action for the continuance of the State Board of Health, was adopted by the convention.

A resolution, offered by Rev. J. K. Stark, requesting the publication of the paper by F. S. Cummings, in *The Centreville Observer*, was adopted.

A vote was taken by the citizens instructing the common council to consider and pass such sanitary ordinances as the discussions of this convention had shown to be essential to the health of the people.

A vote of thanks was given to the people of the Reformed church for the use of their edifice; also to the talented gentlemen (including home talent) who had made this convention so interesting and successful.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

NILES, MICHIGAN,

FEBRUARY 5 AND 6, 1891,

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF NILES.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1891.]

NO. 351.

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1891.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

NILES, FEBRUARY 5 AND 6, 1891.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR THE YEAR 1891.

[No. 351.]

Robert Smith & Co., State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

NILES SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT NILES, MICH.,

FEBRUARY 5 AND 6, 1891.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1891.

This convention was held in compliance with an invitation from the citizens of Niles, under the direction of a committee from the State Board of Health and a committee of citizens.

The following persons constituted the various committees:

Local Committee—Hon. W. I. Babcock, Chairman; Dr. J. H. Richardson, Secretary; William J. Gilbert, Treasurer; Dr. O. P. Horn, W. G. Blish, O. W. Coolidge, Charles A. Chapin, Henry Lardner, Ed. F. Woodcock, Charles A. Johnson.

Finance Committee—W. G. Blish, Charles A. Johnson, Ed. F. Woodcock.

Music Committee—Mrs. J. S. Tuttle, E. L. Hamilton, S. L. Chase.

Committee from the State Board of Health.—Henry B. Baker, M. D., Lansing, Michigan.

The officers of the convention were:—President, Hon. W. I. Babcock, Niles, Michigan; Vice Presidents, Hon. J. J. Van Riper, Niles; Dr. J. D. Greenamyer, Niles; Rev. John Cappon, Niles; Dr. George S. Bailey, Buchanan; Hon. Henry Chamberlain, Three Oaks; Dr. Geo. M. Bell, Benton Harbor, and Dr. R. Henderson, Buchanan; Treasurer, William J. Gilbert, Niles, Michigan; Secretary, J. H. Richardson, M. D., Niles, Michigan.

Among those from other localities in attendance at the sessions of this convention were the following: Dr. J. S. Pardee, Three Oaks; Dr. John Avery, President of the State Board of Health, Greenville; Dr. John H. Kellogg, member of the State Board of Health, Battle Creek; Dr. Victor C. Vaughan, member of the State Board of Health, Ann Arbor; Prof. Delos Fall, member of the State Board of Health, Albion; and, Dr. Henry B. Baker, Secretary of the State board of Health, Lansing.

The first session of the Niles Convention should have been held in the afternoon of February 5, 1891; but, on account of an accident on the Canada Southern R. R., the trains on the Michigan Central were all very late, delaying the attendance of several who were to take part in the first session, which was, therefore, held in the evening of February 5. Also, on account of a funeral in the afternoon of February 6, there was no session that afternoon. The proceedings of the Convention, which were designed to occupy the time of five sessions, were compressed into three sessions.

First Session, Thursday, February 5 at 7:30 P. M.

The meeting was called to order by the President. After a vocal solo by Mrs. Charles A. Chapin, Niles, the following address was given:

PRESIDENT'S ADDRESS.

BY HON. W. I. BABCOCK, PRESIDENT OF THE CONVENTION.

Ladies and Gentlemen—Through the courtesy of the State Board of Health, for the first time a Sanitary Convention is assembled in our city. The questions which will occupy the time of the convention have vital interest for every member of the community, as they relate to the highest interest of each individual, his health. We are favored with the presence of men eminent in their profession who have made the study of the human organism, the diseases which afflict and destroy it, their prevention and cure, their life work. They are with us to open up their well-stored treasures solely for our good, and with little reward save the happy reflection consequent upon having done good to their fellow men. "May their tribe increase," and let us make the most out of so favorable an opportunity, by a wise application of the truths here presented to us.

To live is our inalienable right. There are no qualifications or restrictions to this right, other than those which the laws of nature impose. Life is a priceless boon to be valued over every sublunary thing. All that a man has he will give for his life. The sanctity of human life is apparent in the laws of every civilized society, which regard the taking of life as the summit of earthly crime. When the best use is made of life the most is attainable, in whatever department of endeavor the energies are directed.

In a measure, the protection of our health, and of our lives is committed to the State; but, to a much larger extent, each one must be his own conservator, they must be his own care. If we would preserve our health it is necessary that we should know something of the laws that govern us, and we must conform to those laws. A due regard for our own safety, happiness and success in life would suggest constant care in guarding against every foe to our own health. Yet thousands of precious lives are annually wasted through ignorance or wanton disregard of the laws that govern our being. In our own State little effective sanitary work was done prior to 1873, when the present system—a State Board of Health, was established by the legislature. In 1846, the legislature by enactment made boards of health in townships, and trustees of villages and common councils of cities, boards of health within their respective jurisdictions. By this act they were granted quarantine authority, and power to abate nuisances. It is safe, however, to say that most of such boards were ignorant of their prerogatives, and gave little thought or active effort to sanitary concerns. From the nature of such a system, little improvement in sanitation could be had. Any spasmodic action by one board would scarcely attract the notice, much less enlist the hearty co-operation, of the village or township boards of adjoining jurisdictions. Each was independent, without a central or directing head, hence any organized effort for the suppression of dangerous practices or for guarding against the spread of contagious diseases was impossible. This defect was greatly remedied in 1873, by the creation of a State Board of Health with full supervisory power. The results which have followed the establishment of the State Board of Health furnish abundant evidence of the wisdom and utility of such action.

Without being tedious I desire to cite an instance which was noticed in a former convention: A few years ago an employee on one of the trunk railroad lines in our State was exposed to small-pox in his car near Chicago; He was taken sick with the disease in Montreal, Canada. Little or no sanitary precautions were enforced against its spread, and it is said 3,000 deaths resulted from this one case in that Province. The germs were conveyed to many points in the States, yet with the constant stream of travel into and across our State and with the vast interchange of commercial products with the adjoining Province, Michigan escaped. Our State Board of Health by wide-spread general vaccination and by fumigating all dangerous articles coming from the plague-stricken locality almost completely warded off the direful pestilence.

The saving of life in this one instance was worth more to the State than the cost of the State Board of Health during the entire period of its existence.

In a sanitary convention at Vicksburg, Dr. Baker gave official statistics, which he summarized as follows:—"The record of the great saving of human life and health in Michigan in recent years is one to which, it seems to me, the State and local boards of health in Michigan can justly 'point with pride.' It is a record of the saving of over one hundred lives per year from small-pox, four hundred lives per year saved from death by scarlet fever, and nearly six hundred lives per year saved from death by diphtheria—an aggregate of eleven hundred lives per year, or three lives per day saved from these three diseases! This is a record which we ask to have examined, and which we are willing to have compared with that of the man 'who made two blades of grass grow where only one grew before.'"

The evidence is abundant, but I will forbear.

Sanitary conventions are being held in many towns and cities of our State. This special educating of the people upon subjects of vital concern to all, is of inestimable value. The most enlightened thought of today which science has evolved is presented to us. These health officers are ministers of the law, and should command our hearty coöperation and support. Dr. Lankester says, "The comparatively little impression produced by the great staff of medical officers of health of London arises from the ignorance of the population of the laws of health." In an address before a sanitary congress at Exeter, England, the Marquis of Salisbury said "Educate the people," was the lesson that he earnestly hoped the sanitary congress would impress upon all.

Ignorance of the laws of health has conscripted more people for the grave than all the battle fields of the world. It has been said that "of our Michigan boys who enlisted in the army disease carried off four times as many as all the fields of battle. In the Crimean war 20,000 French soldiers died in battle, 75,000 died of disease. Those great plagues which swept over Europe during the middle ages caused more deaths than all the wars of a century."

Up to the last century or two the most devastating calamities periodically spread over Europe. Scientific men tracing the disease along its backward track found sufficient cause for its origin in the low, wet grounds along the Mediteranean and Black seas, where the people lived in crowded and unventilated abodes surrounded with the accumulated filth of ages, breathing its pestilential air, and drinking the percolations from animal and vegetable decomposition. This scourge popularly known as black

death has prevailed to a limited extent in Siberia during the past few weeks. Some centuries ago London and other European cities were nearly depopulated by it. Scientific men so well understand its cause and the means of restriction through santitary and quarantine control that this plague has ceased to be alarming.

Asiatic cholera, that terrific scourge with which we have been confronted in our day, was for a long time an unsolved mystery. A little more than fifty years ago it started out from its home in India, and, coming in contact with commerce, it slowly and persistently pushed its way until in the sixth year it had covered all Asia, Europe and the United States decimating cities, provinces, empires and republics in its pathway of death. Many of us can easily recall the consternation produced by its later appearances in this country. Scientific men easily trace the disease back to its origin in India where vast multitudes of superstitous worshipers have for centuries periodically assembled in the same place, where by their unwarrantable practices they have maintained a permanent breeding ground for the germs, and on returning these pilgrims have often conveyed them to their homes, or coming in contact with commerce they have been sent on their mission of death to the ends of the earth.

Up to a late period of the world's history any wide-spread pestilence was viewed as a scourge from the hands of an offended Deity. Through their uncompromising superstition the masses, accepting this as the cause, sought relief in humility, prayers and votive offerings. Its disappearance was taken as evidence of the removal of divine displeasure. Even within the present century when besought to appoint a general fast day when England was threatened with cholera, Lord Palmerston's abrupt refusal and recommending sanitary precautions instead was considered sacriligious by many people.

Modern science has accepted and given practical value to the proverb "an ounce of prevention is worth a pound of cure," and perhaps in no department of scientific research has greater advancement been made than in searching out with certainty the causes of communicable diseases, and in finding their prevention and cure.

Dr. Koch would appear to be the most conspicuous figure in medical science of this century. His disclosure of the apparent cure of a certain class of cases of the most devastating plague known in our day has awakened world-wide interest. The discovery of the consumption parasite which has led up to these cures brings the rational hope that the time is not distant when the cause of every infectious disease will be known, and the means of prevention and cure will be discovered and successfully applied. Authorities state that about ten per cent of recorded deaths at all ages and from all causes are due to this scourge, Jenner's discovery of vaccination against small-pox has been adopted in England since about the year 1800. For the fifty years preceding that time small-pox was the cause of ten per cent of the deaths from all causes. In 1887, the proportion of deaths from small-pox was one-tenth of one per cent.

The sanguine hope which has been expressed by some scientific men that the human race is approaching the time when the average of life will exceed the scriptural three score and ten, and all persons of good organism will push up to or beyond the line of a century before giving way to the natural processes of decay which, is the inevitable outcome of old age seems more and more plausable. We are led to believe that thou-

sands of lives are saved by the antiseptic system of surgery brought out by Sir Joseph Lyster. Then on the heels of Pasteur's discoveries for the relief of our race from the terrors of rabies comes the announcement of Dr. Koch's wonderful discoveries which have arrested the attention of all civilization. Next comes the cheering announcement that Dr. Russel, senior pathologist at the Royal Infirmary at Edinburg, has discovered the cancer parasite which he asserts he has traced to the fungus of the yeast plant. Then Dr. Nicolaier has disclosed his discovery of the lock-jaw microbe.

Medical scientists, of prominence, the world over are pushing their investigations all along the line; those who believe the germ the cause of disease and those who dissent, armed perchance with different weapons, but waging a common warfare against a common enemy. To the laity it appears to be a cheering fact that they are on the right track. They have found the germs. They seem to have found the cause of most of the dreaded communicable diseases, consumption whose field is the wor d, cholera which is the curse of Asia, diphtheria which is the curse of two continents, yellow fever which is the curse of the tropics, and many others. Medical science must have the recognition of being more than tentative; it certainly has secured a surer basis.

Ladies and gentlemen, I am unwilling to occupy more of your time, we will proceed with the work of the convention.

RESPONSE, AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY HON. JOHN AVERY, M. D., OF GREENVILLE, PRESIDENT OF THE STATE BOARD OF HEALTH.

(Reporter's Abstract.)

Mr. President, Ladies and Gentlemen—We are very sorry that we could not have been here on time this afternoon, for the first session of this Convention; but, as you are probably aware, there was an accident on the Canada Southern Railroad which caused many trains to be late including the one on which we came.

We are very much gratified to see so many enthusiastic citizens here this evening, eager to learn what they can for the preservation of their health and consequent wealth and future happiness. I need not remind you that this is an age of conventions—the President of the Convention has already referred to the fact. But I am to speak of Sanitary Conventions. These Conventions are held in different parts of the State, and should not be considered as Conventions held exclusively for physicians; they are especially for the enlightenment of citizens in different parts of the State, and to excite an interest in local and public sanitation. Physicians are, however, as a rule, interested in sanitary subjects, and we wish and generally have their hearty co-operation in sanitary work. We are glad to see many ladies present. The ladies are first in sanitary enthusiasm, and you can always depend upon their getting all the knowledge they can on sanitary subjects. The ladies get a large amount of information at Sanitary Conventions and upon going home, talk with their neighbors about what they have learned, and thus sanitary ideas are disseminated among intelligent citizens.

The thirty-three Sanitary Conventions that have been so successfully

held in Michigan since 1880, have been very instrumental in the furtherance of public-health work; and I hope that the State Board of Health may increase the number held each year. The Annual Report of the State Board of Health is a sanitary educator when carefully studied. The Proceedings of sanitary conventions, the reprints of just such papers and discussions as you will hear tonight, are valuable pamphlets to have in every household library.

It is only a few years since the general establishment in Michigan, of the local boards of health, in working order. The local boards of health have great authority. The State Board of Health also has authority, but not for the abatement of local nuisances. It confers with and advises the local boards of health throughout the State, and it acts as an organizer of local boards. Not many years since I called upon the president of our village to convene the board of health, in the interest of public health, and to my utter surprise, the president did not know who constituted the local board of health. Formerly, township and village officers were elected who had no idea of public health, or of the laws pertaining to the board of health. This was more especially true of the townships. But now this is much changed. Now, instead of inactive boards, we have live, active, and working boards of health in most of the cities, villages, and townships. Local boards never took an active part in the restriction and prevention of dangerous diseases until the organization of the State Board of Health, since when they have found that there are duties for them to perform. It is very different now from what it was before the State Board of Health put life into the public-health service of the State; the duties of local boards of health and of health officers are coming to be known, and their valuable work recognized.

It is only a few years since people, generally, did not know that diphtheria and scarlet fever were dangerous communicable diseases. There are some who do not know it yet. Diphtheria and scarlet fever are two of the most destructive diseases, and yet "public funerals" have been held, and hundreds of lives jeopardized by exposure to these dangerous diseases. In most places the people now recognize the great danger in holding public funerals in such cases, and have abandoned that custom. What we want in these Conventions is to have the people learn what to do,—every one should keep away, and there should be no public funeral held in cases of death from a dangerous communicable disease.

You should not submit to not having the public health laws enforced. Every citizen should have the same sense of security against the possible infection of dangerous communicable diseases that he has in regard to security against thieves and assassins. The law should be enforced as much in one case as in the other. The State should take as much pride in bringing to justice the person who disregards the health laws, as in punishing the thief or assassin; a human life may be at stake in either case, but in the case of the dangerous disease the risk does not end with one, but may spread indefinitely.

A "communicable" disease is a disease which may be carried from one person to another, either by direct contact, or by some infected article or thing. Communicable diseases are all preventable. Some of the most common of the communicable diseases are diphtheria, scarlet fever, typhoid fever, whooping-cough, measles and small-pox. Small-pox is the best known, most feared, causes the least number of deaths in Michigan, and should be the least feared. Some of these diseases are known to have

a specific seed or "germ" from which they grow; and others are thought to have a similar origin. Dr. Vaughan will tell you, this evening, that "germs" are seeds and can be made to grow. He has a kind of hot-house at Ann Arbor, also a kind of soil in which he grows these seeds. The soil must be of the proper kind, and in a favorable condition for their growth. It is so with germs in different communities, when they find a favorable soil they grow, otherwise they die. Hence we should take every precaution not to have around or near us "soil" favorable for the growth of the germ. For, if you will keep the germ out of your community, you will keep out the disease. If it does get in, you should isolate the sick, and explain to the people generally that it is for their interest to follow the advice given by the local health officer, and by the State Board of Health. There is no telling who may be the first to contract the disease. If you are sick yourself, see that you expose no one else to the same disease, by your carelessness. You have no more right to expose your neighbor to a dangerous disease than you have to put Paris green in his well. Each one should act as a missionary, and strive to enlighten the people on sanitary subjects.

Disease is spread in different ways. The State Board of Health publishes and distributes pamphlets telling just how each dangerous communicable disease is spread, and how it may be restricted; and these conventions are for the purpose of extending and broadening such information among the people.

Cleanliness in a community insures to the people in that community freedom from certain dangerous diseases. Cleanliness, however, means something more than merely keeping the body and the garments of an indivividual clean. It means, also, a clean house, a clean yard, clean sleeping rooms, a clean cellar, a clean basement, a clean barn and barn-yard, and a clean water-supply. Clean water means water free from typhoid-fever poison, free from the leachings from privies and from unclean soil.

This is an age of economy, but there is question as to the meaning of that word "economy." I can see no economy in educating two hundred doctors at Ann Arbor, every year, to treat you when sick. The State or the community had better pay doctors for keeping you well, instead of your paying a physician to see that you get well after you are taken sick. The doctors are generally sanitarians, and are friends of the State Board of Health. But so long as they are paid only for curing disease, they are not pecuniarily interested in having less sickness—doctors must live. The more sickness in a community the more money in a doctor's pocket; and yet physicians are doing more than any other class to prevent sickness, and that without pay. We have over two millions of people in Michigan, and in every year about 30,000 die*. About one-half of these deaths occur before the close of the productive period of life; and about one-third of the deaths are from diseases known to be preventable, such as diphtheria, typhoid fever, measles, scarlet fever, whooping-cough, consumption and pneumonia. If by paying the doctors as much for their work as health officers, as is now paid them for the cure of disease, we could prevent one-third of these deaths and one-third of the sickness,—would not this be true economy?

Typhoid fever is both contagious and otherwise communicable, and is one of the preventable diseases. A person sick with this disease sustains a

* Not all deaths are reported to the Secretary of State.

loss of three months of working time, one or two attendants involves a loss of six months more time, and the cost for medical attendance, the cost of medicines, etc. A very low estimate of the cost of a case of typhoid fever is $200.00. There are about 10,000 cases, and 1,000 deaths from typhoid fever in Michigan each year. This involves a loss of two millions of dollars annually, which is taken directly from the wealth of the State. Would it not pay to continue the State Board of Health (which costs the State about $18,000 annually), continue and increase the efficiency of the local boards of health, and continue these sanitary conventions, until the people generally shall learn the methods for the prevention of this disease —typhoid fever (which is almost entirely preventable), and, through such knowledge, they shall be induced to generally coöperate for its prevention? It seems to me this would be nearer a true economy.

Typhoid fever is, however, only one of the important dangerous communicable diseases which we know how to prevent, and which will be discussed during this convention.

Thanking you for the attention you have given, I give way to those who are to follow.

The address "The Germs of disease," by Victor C. Vaughan, M. D., member of the State Board of Health, Ann Arbor, Mich., was not in manuscript form and could not be here reproduced; but, by request the following has been substituted.

THE WATER SUPPLY OF CITIES.

BY VICTOR C. VAUGHAN, M. D., MEMBER OF THE STATE BOARD OF HEALTH, ANN ARBOR, MICHIGAN.

The question of the water supply of small cities is one of great interest and importance. There are in the United States each year about 40,000 deaths from typhoid fever and not less than ten times this number of cases of sickness from the same disease. Many eminent sanitarians believe that impure drinking water is the sole cause of typhoid fever, and all physicians agree that such water is accountable for the great majority of the cases. It is certain that if contamination of the water, soil and air with animal excretions were wholly prevented there would be no typhoid fever. This is no idle dream of visionary students of public health. It is already a practically accomplished fact in a few cities. In 1849 the death rate from typhoid fever in Munich was 24.6 per 10,000 inhabitants. At that time the excretions from the body were disposited in privy vaults and the drinking water was taken from shallow wells closely adjacent to the receptacles of filth. First, sewers were built and the use of vaults prohibited. Later, a fresh water supply was introduced, and in 1884 the death rate from typhoid fever in Munich had fallen to less than 0.5 per 10,000 inhabitants. A result almost equally striking has been accomplished at Vienna. Even in New York with its notoriously garbage filled alleys, the death rate from typhoid fever, thanks to care taken with the water supply, is only 2 per 10,000, and in Brooklyn 1.5 per 10,000, while the average throughout the United States is about 6.6. In truth, this, the typical filth disease of the century, is more prevalent in the small cities and villages than in the crowded metropolis with its great hordes of paupers from every nation gathered in its huge tenement houses.

If typhoid fever has been practically stamped out of existence in

Munich and Brooklyn, why should it be allowed to prevail in our small cities and villages? The failure to prevent the ravages of this disease cannot be attributed to ignorance of its nature and origin. We are not in the condition of the inhabitants of London, when visited by the black plague in the 17th century. They were attacked by an unknown foe. They knew nothing of the origin of the disease and practically nothing of the means by which it was spread. They were struck down by an invisible hand. This is not true today and especially not true of typhoid fever. The enemy hangs out its banner from every slaughter house, the offal from which pollutes the river or lake from which the city takes its water-supply. It establishes its garrison of germs in every filthy cesspool and vault. Notwithstanding these visible evidences of the approach of this disease, it is allowed to slay 40,000 of the "flower of the land" annually.

Would it pay to exterminate this disease? In answering this question, I will lay aside all questions of sentiment and look at the matter exclusively from pecuniary standpoints. Conservative estimates place the value of the average adult life to the State at $1,000. This is reached in two ways: (1) The average production of the adult, and (2) the average cost of rearing a person from birth to the age when that person becomes able to support himself. If the average adult life is worth to the State $1,000, the average life of those destroyed by typhoid fever is still greater; because the majority of deaths from this disease occur in early manhood or womanhood. But taking this estimate, the financial loss to the country yearly in the deaths from typhoid fever amounts to $40,000,000. Then there are at least 360,000 who are sick, but not fatally, who are incapacitated from labor for weeks, the sum lost to the State in this item would reach up among the millions. It should be remembered that these figures represent an annual loss, and it will be admitted that these sums saved for a few years would supply every city of 2,000 or more inhabitants in this country with a safe drinking water-supply.

SOURCES OF SUPPLY.

Waters used for public supply may be divided into surface and subterranean. Among the former are those from the rivers, lakes, shallow wells and superficial springs. Among those are to be found some most excellent waters and many which are exceedingly dangerous. The purity of a surface water will depend upon the condition of the soil upon which it falls, over which it flows, or through which it percolates. The waters of mountain and highland lakes are among the purest found in nature, and the majority of rivers furnish a safe potable water unless they be contaminated by sewage in one form or another; but as soon as such contamination begins these waters are no longer free from danger. No surface water is perfectly safe as a public supply unless the territory which it drains can be protected from the introduction of harmful material. A single slaughtering house or privy vault on the bank of a stream and pouring its refuse into the same either directly or by filtration through the soil for a short distance may poison the water used by a city. Unless the various State legislatures take up this matter and make the pollution of streams and lakes a penal offense the time will soon come when no river or small lake in our country will furnish a safe supply of drinking water. Such protection has been furnished the Croton water by the State of New

York for many years with a gratifying success as is shown by the low mortality from typhoid fever in New York city, already referred to. It has been proposed that certain streams should be selected for water supplies and their pollution be prevented, while the use of other water courses for the disposal of sewage be permitted. A surface water under the existing state of things may be fairly pure and perfectly safe today, when a month later it may be swarming with the germs of typhoid fever.

In the less densely settled parts of the country many lakes now offer a fairly good water supply, but unless the drainage-area of these lakes be protected from contamination their clear waters will become the bearers of disease and death to those who drink of them. In Massachusetts the State board of health is given general supervision of the water supplies of cities, and the contamination of a stream can be prevented, by application to the Supreme Court, for a distance of twenty miles above the intake. This distance is too short and in time will be extended. With improved methods of the disposal of waste by means of sewerage farms the necessity of polluting streams will, we may hope, be removed soon. Local authorities, unaided by the State, find their jurisdiction too limited to cope with this subject. At a recent meeting of the American Public Health Association, the following resolution was adopted: "*Resolved*, That it is the well considered belief of this Association that it is an imperative necessity, especially in the more populous states, that the state legislatures should give their boards of health that financial support which would enable them to act intelligently on all questions pertaining to the public water supplies, investing them at the same time with the supervision of the said supplies, and with the power to preserve these waters from contamination by sewage or other injurious matters." This represents the present feeling of the most intelligent sanitarians of this country in regard to the employment of surface waters for the supply of cities and villages.

Shallow wells are notoriously impure, because almost universally they are placed in close proximity to privy-vaults, cesspools, or other receptacles of filth. Surface springs are no better. A spring is to be regarded as a surface one if its water is influenced in amount or character by recent rains, or if the temperature of the water varies decidedly with the seasons of the year. It was formerly thought that filtration through a few feet of soil was sufficient to purify a water, but the writer showed in 1880 that the ordinary gravel which constitutes so large a proportion of the soil of Southern Michigan has but little effect in removing or oxidizing soluble nitrogenous substances from solutions which are allowed to pass through such soils. Furthermore, he demonstrated that such soils soon become saturated, and then no longer have any effect upon the removal or oxidation of these organic substances. The excretions from a family of six persons are sufficient when dissolved to saturate over seven cubic feet of gravel soil. From this it is evident that only a few weeks, or months at most, would suffice with a proper amount of rain-fall to saturate every cubic foot of soil to a depth of five or ten feet in a small yard in which we often find privy-vault, cesspool, and cistern, or well, in close proximity.

Of course if these substances are not destroyed by filtration, they will be carried by the water which passes through the soil wherever such water may go. If the water gains an entrance to the well, it will carry with it the substances in solution. At this rate it would require more than a few feet, or even rods, of intervening soil to prevent the contamination of the

water of wells or leaky cisterns from privy-vaults, which often are not cleaned once a year, or from cesspools or cemeteries.

By subterranean waters, we mean those the source of which lies below some impervious geological formation. Such waters are protected, if properly piped, from surface contamination, and are the only natural waters which we may hope to find wholly free from germs. Deep springs supply the purest waters in the world. Unfortunately, however, such springs are rare, they are often not within the reach of cities, and the amount of water which they supply is limited. The waters of artesian wells frequently contain so much mineral matter that they are not suited for use. When this is not the case, the amount is likely to be too small. However, a few large cities have been fortunate enough to obtain an abundant supply of good subterranean waters. This is true, for instance, of Brooklyn, N. Y., and of Memphis, Tenn. Vienna has recently changed its supply from the dirty Danube to deep springs, and while the annual death rate from typhoid fever was as high as 34 per 10,000 inhabitants, the disease has become so rare that when a case of it is brought from outside of the city to the great hospital, it is, according to Prof. Nothnagel, shown to the students as a great treat.

THE PURIFICATION OF WATER.

Many attempts have been made to purify foul water on an extensive scale, and these have been partially successful. The muddy water of the Mississippi river at St. Louis is collected in settling basins. There are four of these basins and each holds about 18 million gallons. The floors are paved with brick, and these are cleaned about three times per year, the quantity of deposit removed annually amounts to nearly 200,000 cubic yards, and there can be no question that it is better to have this vast amount of filth deposited in the settling basins rather than in the alimentary canals of the consumers. During the spring, the 20 millions of gallons daily distributed to the citizens of Cleveland contain about ten and one-half tons of suspended matter. It would be well if this could be gotten rid of by sedimentation in basins. Preparations of iron are sometimes added to the water in order to make the precipitation more complete. However, while the water is much improved by sedimentation, the germs of typhoid fever are not gotten rid of in the process. Indeed, as sedimentation goes on in the basins the germs, if present, are constantly multiplying.

Many devices for the purification of water by filtration, or by precipitation and filtration are now in use. Some of these methods are eminently successful in rendering a turbid water clear, and in thus far improving its quality, but none of them are capable of rendering a disease-producing water safe. The water supply at Atlanta is so muddy and so deeply colored with red clay that it cannot be used for laundry purposes, but after precipitation with alum and filtration, small objects may be distinctly seen through 20 feet of the water. However, clearness is no evidence that the water does not contain the germs of disease.

REMARKS BY JOHN H. KELLOGG, M. D., MEMBER OF THE STATE BOARD OF HEALTH, BATTLE CREEK, MICHIGAN.

(Reporter's Abstract.)

[Dr. Kellogg spoke of leprosy as a dangerous communicable disease that had been done away with, and continued with his remarks, of which only a brief abstract is here given.]

In the United States, at the present time, consumption causes more deaths than any other disease. In the United States about 100,000 die from consumption every year, which is about one-eighth of all the deaths that occur. Whole families have contracted consumption, by being careless with consumptive patients in the house. In one instance a consumptive was permitted to expectorate on handkerchiefs and, instead of washing the handkerchiefs, his wife would dry them and then rub in her hands until soft and ready for the sick man to use again—she contracted the disease and died from consumption very soon after her husband died. Consumptives have been allowed to expectorate on the floor of rooms that they occupied, the sputa became dry and, along with the dust, were carried to the walls of the room. Scrapings from the walls of these rooms, where consumptives have lived, have been inoculated into guinea-pigs and have produced consumption in those animals. Chickens fed on the sputa of consumptives have died of consumption, and the germs of consumption, were found in the dead chickens. People inherit a tendency toward consumption, and do not inherit the disease; but can easily contract the disease, just as a susceptible person does small-pox.

The question is asked: Why do we not all die of consumption? Those who come in contact with the germ, and can furnish a favorable soil for the growth of the germ—in other words are susceptible to the disease—do contract the disease. Nature has protected us from the entrance of the germ, into the body, by the skin and mucous membrane. The germs cannot get through the skin or mucous membrane except that there is some abnormal condition of those tissues. If the skin is abraded, the germ will quickly work its way through the unprotected part, and will seek its way to a part of the body susceptible and ready to furnish a favorable condition for its existence and growth.

The question is asked—Why do not harmful germs, even more frequently, destroy us? It is because the body has the power to resist their attack. When germs do get into the body, there are different tissues and cells which are their enemies and are, generally, ready to fight them. The white cells of the blood sometimes absorb and cause the destruction of germs. When the body is in a run-down condition we are more liable to contract disease. Hence it behooves us to make an effort to keep our systems in the best possible condition. People with a small lung capacity should resort to some physical exercise which would increase the lung capacity. The lungs must have ample room in which to do their work. There are two types of respiration—*abdominal and thoracic.* (Dr. Kellogg here asked a little boy and girl to come on the platform that he might be able to illustrate the next subject of his remarks. A little boy about twelve years of age responded; but no little girl responded.) This little boy has the abdominal type of respiration, and thus breathes in the *natural* way. The chest expansion of this boy (measuring the boy with a tape measure) is 2½ inches. This large expansion is due to the boy never wearing tight clothes. If I were to measure a girl, before she puts on tight

clothing, I would find a similar respiration. I once measured a little girl whose chest expansion was 3½ inches. At the same time, I measured the chest expansion of a young lady, who wore tight clothing, and found that her expansion was just *one-eighth* of an inch—this was the thoracic type of respiration. In young ladies, who wear corsets and tight clothes hung around their waists, the lung capacity is necessarily lessened, and the action of their lungs is restricted. I have measured the chest expansion of thousands of males and females and found that in every instance there was the natural abdominal type of respiration, except when tight clothing prevented such respiration. In tribes of Indians where tight clothing is unknown the respiration in the males and females is the same. Among civilized people, consumption is more fatal to women than to men.

Prof. J. D. Schiller was next on the program; but, it being a late hour, the sense of the convention was, that this paper be postponed until the morning sesion, when it was read.

Second Session, Friday, February 6, at 10:00 A. M.

THE HYGIENE OF SCHOOLS.

PROF. J. D. SCHILLER, SUPERINTENDENT OF SCHOOLS, NILES.

Educational forces like those of nature, work accumulatively. If it is true, as Emerson says, that all foregone days of virtue work their health into this day, it is true that all educational victories in the past tell on the progress of the present. The visible actors have a great invisible line behind them pushing them forward. There has never been a time in the history of our school system when there have been so many earnest intelligent workers, and never before has there been such a pressure brought to bear upon them to keep abreast of the times and the demands. The term education has a far broader meaning now than it had twenty-five years ago. Then it meant simply to sharpen a boy's or girl's wits in order to be fully equipped to cope with his fellows, and secure more easily a proper share of this world's goods. But we have risen to a broader comprehension of the term, viz.: a harmonious development of the physical, mental and moral part of the child. In this paper we are to confine ourselves to the first named division, or rather its preservation.

The value of the maintenance of physical health will hardly be questioned by any thoughtful person, certainly not by any educator; for while the mind does sometimes appear to act independently of the body, there are numerous instances on record which show that not only intellectual inefficiency is directly traceable to ill health, but moral obliquity also. Illustrations of this are not wanting in the experience of every observing person. So well established has this connection become, and so important has the subject of physical health in education been deemed, that no prominent educational writer has failed to notice it.

One of the most hopeful features of modern education is the growing recognition of the importance of physical training in school. By thinkers and educators the necessity of a trained body as the instrument of a trained

mind, is fully recognized and is being acted upon by the great mass of teachers. "To the wise educator," says W. T. Harris, "Nothing is more certain than that the child is an animal with the possibility of reason." As remarks a suggestive writer, the first requisite to success in life is "to be a good animal," and "to be a good nation of animals," Says Spencer, "is the first condition of national prosperity." "No perfect brain ever crowns an imperfectly developed body," says Dr. E. H. Clarke, of Boston. Montaigue truly says, "we have not to train up a soul, nor yet a body, but a man, and we cannot divide him."

Physical training and drill should, therefore, be a part of the regular business of a school. If something of the kind is not done, our physique, which has been a grand one, will, especially in our large towns, become extinct. Under the keen competition of modern American life, the application required of almost every one is such as few can bear without more or less injury. Already thousands break down under the high pressure they are subject to. If this pressure continues to increase, as it seems likely to do, it will try severely all but the stoutest constitution. Hence it is becoming of special importance that the special training of children should be so carried on as not only to fit them mentally for the struggle before them, but also to make them physically fit to bear its excessive wear and tear.

Happily the matter is beginning to engage the serious attention of school authorities and people generally. The result of all this is seen in the improved character of the school buildings which are everywhere being erected. In these we find that greater attention is paid, not only to the space demanded for each pupil, but educators have come to see that lighting, warming, ventilation and general sanitary conditions are of prime importance in their bearing on the health and progress of the children gathered in these schools. Much still remains to be learned in regard to these matters, and it is of the highest importance that school managers and all who are concerned in the erection of school buildings, or what is perhaps equally, if not more important, the modification of already existing schools, should be well acquainted with the principles which determine the sanitary condition of all school premises and arrangements. But, however healthful the sanitary conditions of school premises, it is evident that the health of the school must depend also largely upon the routine, the distribution of work in relation to age, the amount of exercise and rest, and other matters which concern the personal treatment of the scholars.

This branch of school hygiene is necessarily more in the hands of the teacher, and it is therefore important that he should be well instructed in the general laws of health as applied to school life. It is gratifying to observe that a knowledge of physiology and hygiene is made an essential part of the professional training of teachers and is among the requirements for all grades of schools in our State.

SCHOOL SITES.

Modern sanitary science has given such particular attention to the subjects of site and exposure, and has impressed the public mind so thoroughly with the necessity of their healthfulness that only willful ignorance or pecuniary considerations will in this day permit a building designed for human occupancy to be placed in a manifestly unhealthy location. The

healthfulness of a school site, however, depends very much upon the character of the soil, elevation, drainage, remoteness from stagnant water or marshy ground, and from factories from which issue offensive gases. While no school authorities would err so far as to place a school house in a situation decidedly unfavorable in regard to any of these considerations, there exists between this and a decidedly healthy location all manner of intermediate situations, which call for the exercise of good judgment and a knowledge of sanitary science, in deciding upon their fitness as sites for a school. In our larger cities, where the choice is somewhat restricted, the site being often "made ground" formed by bringing earth from a distance, consisting often of the refuse and garbage collected from dust bins and cellars and deposited over spots originally low and swampy there is often a great destruction of health. The gradual putrefaction of such organic matters, the slow oozing up through the soil of poisonous gases, leads to the production of effluvia, which mount into the school rooms, and may develop diphtheria, fever and ague and other diseases. In connection with all these conditions, children are much more prone to suffer than adults. Their resisting powers are smaller, and they sooner fall victims to the results of bad hygienic conditions. The choice of location, therefore, should always be such as to avoid these influences so hostile to health.

ARCHITECTURE.

This subject, though intimately connected with the pecuniary interest of the tax payer, has received much attention of late years on the part of skilled architects and committees in charge, especially in our larger cities, and many of our modern school buildings are models of symmetry, convenience and comfort. Much, however, remains yet to be done, as the subject of light, heat and ventilation are problems as yet to be solved. Much progress has been made in these particulars, and with the present attention given to these subjects we may hope for a partial solution at least in the near future.

But while we have made progress in these particulars, there is one subjuct that has been overlooked or ignored, and that is the injurious effects resulting from climbing several long flights of stairs to reach the upper floors of high buildings. From a close observation for several years, I cannot refrain from making a most earnest and solemn protest against the erection of any school building above two stories. By the present system of seating pupils, beginning with the primaries on the first floor and ascending with the advance of grades, our girls reach the higher floors just at that delicate period in their lives when they pass from girlhood to womanhood. At this critical period they are obliged to climb several times a day long flights of stairs for a period of four long years and lay the foundation of future ill health if they are not compelled to leave school before. Many of the girls in all our high schools are obliged to leave school before they have half finished the course. A superintendent informed me a short time since that fully ten per cent of the girls in his high school were obliged to leave school from this cause. No subject connected with the hygiene of our schools calls for more urgent reform unless it be that of ventilation.

The shape and size of school rooms has not received that consideration that its importance demands. Too often the aim seemed to be to get the maximum of pupils into the minimum of space. The matter of con-

venience, lighting, heating and ventilation has been of minor importance. School rooms, to subserve those purposes, should be in the shape of an oblong the sides of which bear the proportion of 4 to 3, each room allowing at least 120 cubic feet per pupil, of which at least 10 square feet should be floor space. In England the minimum government requirement for primary schools is 80 cubic feet per pupil, with not less than 8 square feet for floor space.

The internal wall surface should never be white washed or color-washed. The plaster of the room may for a time serve to neutralize the carbonic acid from respiration, but this action will soon cease and the walls become saturated with volatile organic matter from respiration, etc., which tends to maintain the atmosphere in an impure condition, even though fresh air is admitted. It is far better to have impervious polished walls by the use of paint or polished cement. These can be washed and thus kept free from impurities. The proper lighting of a school room should not be overlooked, as much of the happiness of the children depends upon the amount of sunlight admitted. The depressing effects of a dull day are often due to the absence of sunlight. The best way to stop a canary singing is to cover his cage with a shade; and the bright spirits of children are similarly affected by dull, dark school rooms. The mental effect of deficient light is also generally accompanied by physical effect. Human beings, like plants, grow weak and pale without light. There is a proverb which says: "Where the light cannot come the doctor must." It is noticeable, also, that the attendance in a badly lighted school is always less regular than in a cheerful well lighted school.

Since so large a part of a child's life is spent in school, and at a formative period, when the impressions made by the surroundings do so much to shape the life of the future man or woman, the school room should be made not only the healthiest, but the brightest and happiest spot of his life.

Small windows, often half shaded by dirty blinds or torn curtains, are common defects among our schools. The furniture and paints often increase the general gloom.

Windows should reach nearly to the ceiling, as the best light comes from the highest point, and much of the cheerfulness of the school room depends upon the amount of sky visible. Shades should therefore be made to roll from the middle toward the top and bottom.

The window area is variously estimated from one-fourth to one-tenth of the floor area. This, however, must vary with the outside surroundings. The direction of the light is also a matter of great importance. The worst light is that which comes from windows facing the scholars. A light, from behind, obliges the scholar to sit in a twisted position in order that his book may not be in the shade. The best light is that which comes directly from the left, and does not necessitate any other than an erect posture that it may fall directly on the desk. The lower lights are of comparatively little use in admitting light for study as it comes too horizontally.

VENTILATION.

It has been well said that "our breath is our greatest enemy," and the problem of a healthful school room is, to a large extent, solved by the application of measures for removing this, and furnishing an abundant

supply of pure air, without the production of perceptible draughts. But this is a problem which has not yet been solved. In most of the school buildings throughout the country little or no attention is given to ventilation, and in consequence, there is not only a loss in diminished results, but a positive injury in the form of various diseases. This evil is so formidable, and so universal, that it should receive particular attention from teachers and those who have the care of schools. Before the importance of ventilation can be fully realized, and the amount of fresh air required can be ascertained, a knowledge of the physiology of respiration is necessary.

Pure air consists of one part oxygen to four of nitrogen, with a small fraction of carbonic acid. The oxygen of air is absolutely essential for the continuance of all forms of animal life. By means of our lungs it is furnished to the system, and at the same time carbonic acid gas and other impurities are eliminated. With each pulsation of the heart the blood is sent to every part of the body, including the lungs, and is subjected to this purifying process nearly twice every minute. During this process the air has undergone some changes. By coming in contact with the warm blood it has been warmed, taken on a certain amount of moisture which is given off in the form of vapor, and parted with four per cent of oxygen and taken in its place four per cent of carbonic acid. It is estimated that out-door air contains four parts of carbonic acid, in 10,000 of air, while the expired air contains 400 parts. Healthy adults would therefore, exhale about 14.4 cubic feet of carbonic acid per day.

But the greatest change, and by far the most deleterious to health of expired air, is the amount of volatile organic matter or germs of a highly putrefiable nature which it holds in suspension. This is invisible under ordinary circumstances, but is none the less foul and offensive. While carbonic acid is far from being harmless, yet it is innocent compared with the organic particles which emanate from our own bodies. When these are not removed by ventilation, they are rebreathed, and instead of the blood being purified twice each minute, it becomes gradually vitiated and poisoned. The child who has had no bath for weeks or months is shunned or sent home, and rightly too, but what is uncleanness of the skin compared to the delicate membrane of our lungs? We refuse to drink foul water, or eat decomposing food, but we frequently inhale air that is fouler than the dirtiest ditch water. Our children are crowded into school rooms in which they are forced repeatedly to breathe their own and other children's breaths, to the sad injury of their health.

This subject has not received the attention its importance deserves because the evil effects produced by expired air are not immediately apparent. The drowsiness and languor so frequently noticeable in school children are not so much an indication of willful inattention, as of a necessity for purer air. It cannot be expected that the brains of children will be in active exercise of their functions, while they are provided with blood which is vitiated by respiratory impurities.

Children are especially susceptible to the dangers resulting from impure air. They are necessarily somewhat massed together, and the organic matter hanging about the room serves as favorable soil for the propagation and development of infectious diseases which, in a pure air, would soon lose their vitality. May we not look for the propagation of diphtheria, scarlet fever, and like diseases in the school room?

To the intelligent teacher, the great problem of ventilation is to secure

a sufficient interchange of air without causing draughts. But how is this to be accomplished? When the external temperature reaches 60° or 65° the air may be freely admitted. Windows and doors can be opened, especially during recess or calisthenics, and the rooms thoroughly flushed with pure air. But where the temperature falls below 50° and the temperature of the room is 65° or 70° it is almost certain to produce a draught.

It remains then, that a successful system of warming a school must necessarily, for purposes of health, provide pure air and a successful system of ventilation must, at least in winter months, also furnish warmth. This brings us face to face with the serious question of expense. The warming of a large volume of air means the expenditure of coal, and ventilation means the discharge of this warmed air as soon as it becomes impure. If no provision is made for the escape of the warm air when it becomes polluted, the school room speedily becomes foul and unhealthy and a hot-bed for disease. I believe, however, that when the expensiveness of ventilation is fairly grasped by the people, that the economy of fuel is at the expense of the children's health, that it tends to increase our mortality, there will be an end to economy in that direction.

No system of warming and ventilation has yet been devised that is perfect, but good progress has been made in that direction, and the Ruttan system with dry closets is acknowledged to come nearest to the grand ideal.* The air is taken from the outside, warmed, and when it has served its purpose in the rooms it is withdrawn and made to pass over the excreta in the closets before it ascends the flue leading out of the building. It is effective, economical and settles the difficult question of pure closets.

Very few, if any, of our rural schools have any means of ventilation, except by open doors or windows, or what is still worse, through cracks in the walls or windows. The subject is not even thought of, or discussed, by those who send their children there. As these school houses are nearly all heated by large stoves, a very little added expense would purchase what is called a furnace stove with an air opening beneath, connected with the outside by means of a flue. This pure air from the outside is warmed in a jacket around the stove before it enters the room. The amount of air let into the room can be regulated by a register at the top. An opening into a flue at the base of the chimney will serve to draw the impure air from the room.

I have confined the discussion of my topic mainly to the subject of ventilation in school, believing it to be of the first importance to the welfare of the children and youth, and all intelligent interest we can arouse on the subject must be founded upon knowledge of its principles. These principles must be discussed and reiterated until they are as familiar as household words. The attention of the people must be called to the existing evil, and communities flooded with the truth before we can expect them to give heed.

Legislation will not cure all our evils. But I believe, that instead of repealing the law creating our State Board of Health, an enlargement of its power so that it would include a general system of sanitary inspection would redound to the physical welfare of the people. This is done in many countries of Europe and is found entirely practicable. The location, architectural details, such as lighting, heating, ventilation, floor and cubic space for each pupil, and the arrangement and management of school

* [Attention is respectfully asked to the resolution relative to opinions of authors of papers, printed on the second page of this pamphlet.—*H. B. B. Sec. State Bd. of Health.*]

buildings are all regulated by law, and are looked after officially by medical inspection. The hygienic conditions of our schools would be greatly improved by a system of official inspection by medical experts.

I will say just a word in regard to the location and hygienic condition of our own school, and I will bring this paper, which has already exceeded the length intended, to a close. The central school stands in the midst of a beautiful oak grove, three acres in extent, laid out in Portland cement walks and ornamented with a magnificent fountain. It has a seating capacity of seven hundred, is heated by steam and has a good system of water closets on the first and second floors, connected with the sewer. The ward schools are all surrounded by ample grounds with a soil of sandy gravel.

Our ventilation is mostly of the primitive style of doors and windows, but the teachers are fully alert to the necessity of ventilation and succeed fairly well.

We have no recess, but shorten the sessions fifteen minutes and practice calisthenics, in the middle of each session, below the high school. The sessions of the primary grades are four hours. Our drinking water comes from Barron Lake, for the central school, and from wells in the ward schools. I fear that some of the wells are in such proximity to the water closets that they would not bear inspection by a board of health.

The President announced that, as Mr. Edward Bacon was unexpectedly called away to try a case in the Supreme Court, Mrs. Bacon would read the paper prepared by Mr. Bacon, which was as follows:

THE RESTRICTION AND PREVENTION OF DISEASES.

FROM THE STANDPOINT OF A LAWYER.

BY EDWARD BACON, ATTORNEY, NILES, MICHIGAN.

In the book of nature's laws there is a chapter concerning the public health, plain and legible. The meaning of its first provisions is that whenever and wherever the human race becomes too vile or too miserable to live, the exterminating pest that spreads like wildfire may come to put the wretched out of their misery. Then the desolation made is clean and free from sufferers, ready for new occupants to be received on probation.

On our statute book of Michigan are well-known laws for the restriction and prevention of dangerous, communicable diseases. In every township, incorporated village and city is a municipal board of health with extraordinary powers equaling those which in time of war are derived from military necessity to resist the public enemy. These powers are not only to investigate all causes of such diseases, but to remove and destroy these causes; regulations are authorized in the nature of ordinances, warrants, special proceedings are provided for, and the right is given to command all necessary force. There are also adequate laws for necessary drainage of malaria producing lands, and stringent enactments to prohibit the sale of adulterated and unwholesome food and drinks.

The municipal boards of health and the business corporations in this State are to make reports such as may be required by the supervising State Board of Health, comprising seven members and having a permanent secretary. This State board is to make all necessary investigations, not only in matters of fact, but also in questions of science; is to compile proper statistics, and give all necessary information and instruction to the subordinate boards by published reports and answers to special inquiries.

Such has been the success of these laws and of preceding laws like them, and so many years have gone since any destroying pestilence, that the importance of these statutes is hardly appreciated. Even the cholera of about sixty years ago did not adequately represent the plagues of old, which caused every government, from the dawn of history, to do its utmost in defense against pestilence not less than against invading armies.

The invisible, malign influence which "walketh in darkness" and "wasteth at noon day" was attributed to the wrath of angry gods. Homer's Iliad, first and greatest of epics, unsurpassed in any age, has in its beginning a specimen of primeval proceedings to stay a plague. The god Apollo is angered because of insults to his priest.

"Down he came,
Down from the summit of the Olympian mount,
Wrathful in heart; his shoulders bore the bow
And hollow quiver; there the arrows rang upon
The shoulders of the angry god,
As on he moved. He came as comes the night,
And, seated from the ships aloof, sent forth
An arrow; terrible was heard the clang
Of that resplendent bow. At first he smote
The mules and the swift dogs, and then on man
He turned the deadly arrow. All around
Glared evermore the frequent funeral piles.
Nine days already had his shafts been showered
Among the host, now, upon the tenth,
Achilles called the people of the camp
To council. Juno, of snow white arms,
Had moved his mind to this, for she beheld
With sorrow that the men were perishing.
And when the assembly met and now was full,
Stood swift Achilles in the midst and said:
'To me it seems, Atrides, that t'were well,
Since now our aim is baffled, to return
Homeward, if death o'ertake us not; for war
And pestilence at once destroy the Greeks.
But let us first consult some seer or priest,
Or dream interpreter, for even dreams
Are sent by Jove, and ask him by what cause
Phœbus Apollo has been angered thus;
If by neglected vows or hecatombs,
And whether savor of fat bulls and goats
May move the god to stay the pestilence.'"

Powerless was brazen armor; powerless, sword and scepter against the wrath of immortal gods, whose rage might be increased by any resistance; the only hope was in priest and pontiff. Fortunate was it if the divinities, speaking through their priestly agents, could be appeased by the blood of hecatombs of sheep and cattle, and the odor of these in the burnt offerings.

Not unfrequently, the dreadful gods demanded human sacrifices; the loveliest children, the fairest maidens and the most perfect youths must be

victims. The plague naturally exhausted itself; the horrible sacrifices seemed a success and became precedents for repetition.

As one awaking in the bright and happy morning forgets horrible dreams of night, so now the world forgets the fearful happenings of ages gone.

There certainly has been progress in defense against pestilence; here pre-eminently, knowledge is power. In times of the crusades and afterwards, the leprosy overspread Europe, even to Norway. In England, then sparsely populated, there were about one hundred leper houses or hospitals of the first class. But christian governments on suggestion of the Mosaic law, made and enforced such reasonable regulations to isolate lepers and prevent their multiplication, that the horrid disease has almost disappeared from the European continent.

The most deadly of pests the plague known as the "black death," which seemed able to exterminate whole nations, has for more than a century, been unable to find among civilized people, the degradation and loathsome conditions necessary to its former work of devastation.

By one fortunate discovery and the enforced use of it, small-pox is deprived of its terrors.

Under the banners of science, the war for the defense of mankind against pestilences goes bravely on and the distinguished attention which the experiments of Pasteur and Koch have recently received from men and institutions of learning, prove to the world that the day is past when light must be disregarded because it is new; when investigation must stop, if it is likely to expose errors which have deceived those who esteemed themselves infallible.

The German Kaiser makes good use of his autocratic power, above the reach of elections, to give the world object lessons, teaching a model system for the reward of all meritorious discoveries and for the support of the devotees of science, in institutions where each specialty must be supplied with all means and appliances that the National treasury can secure for experiment, investigation and study.

It is not true that politics and popular government render the United States unable to equal Germany in the mighty work of delivering the human race from diseases which have been almost irresistible. The little Athenian republic gave to the world more light than all the despotisms that ever existed.

No theory of the rights of man, peculiar to popular government, presents any obstruction. The monarch, his courtiers and nobility can always take good care of themselves in places of safety; the people have the most to fear from infection and contagion, and are most interested that proper laws be enacted and enforced. Such laws are but self defense, and self defense which justifies even the taking of life, must justify all that is necessary.

The inquiry arises, to what extent shall these laws go? There might be such extreme enforcement of existing laws of Michigan, that they would seem like the laws which caused Sancho Panza to surrender his exalted honors rather than live under a guard of doctors who, for the safety of his precious life, forced him to control the gluttonous appetite for the indulgence of which he lived.

There is no law to enforce any principle or any of the rights of man which, in its execution, may not easily be carried to such extremes as to be brought into general derision and odium, resulting in failure. Every

statute book has its obsolete laws. The limits which may not be passed are fixed; they extend as enlightenment extends.

We shall have more light; we shall have the decision of scientific questions, on which depends the deliverance of millions from untimely death or from life that is worse than death. First, there must come long continued observations and classification of facts; there must be careful experiments with expensive appliances extending through more time than is allotted to one generation; there must be investigations in far countries; devotees must give their lives to science for her own sake, not for gain, and their country must support them free from care and want. This cannot be accomplished by private persons or private institutions.

Our federal government, aided by every state, is wonderfully adapted to excel all other governments in institutions which, like the University of Michigan, shall not be degraded by politics and which shall have all the necessary means and appliances, and the men of inventive genius peculiarly American, who are willing to be true devotees of science.

Wonderful discoveries for the benefit of suffering humanity are sure to come in the twentieth century, now near. There must be such legislation that these discoveries will be public property, never to be monopolized under patent laws for gain or extortion.

Those who have no sympathy with socialism in its war against the existing institution of property will nevertheless be ready to believe that the theory of State socialism ought to succeed to the utmost, in abolishing and prohibiting private rights of property in the great discoveries for the relief of human suffering, the knowledge of which ought to be forever free to all the world. All patent laws or other laws under which these discoveries can be monopolized for private gain ought to be amended so as to be inapplicable. Such an amendment would do much to relieve the people from innumerable cruel impositions to extort money from the sick and the dying, and which, in the form of patent medicines have become of themselves a pestilence.

A small part of the immense amounts of money annually taken from the people by patent medicines, which the simplest analysis could demonstrate to be base impositions, would support in affluence grand national institutions, unequaled by any in the world, and would enable the government to offer magnificent rewards for every life-saving discovery that could be proved.

The laws which shut out the lottery gambler from the use of the mails and of the press, can easily be extended and made to strike with prohibitions and penalties the shameless impostors, who, not content with enriching themselves by extortions from credulity and fear, are doing much to undermine the public health.

Yet, patent medicines with all their lying advertisements which overload every newspaper and magazine, are insignificant evils in comparison with the notorious adulterations of food, which have almost driven purity from the market, and by their extent have rendered the laws against them no more than a dead letter. The effect of these adulterations is a process of slow poisoning for the entire population, not unlikely to go on from bad to worse until, if it be possible, some disease like the black death of the middle ages will appear as a natural result.

In the recent oleomargarine contest, the desperate struggle to sell the counterfeit under the name of the genuine, and to conceal from purchasers

the nature of the article for sale, contains suggestions of interest to the nation.

If every manufacturer and every wholesale or retail seller of medicine, or articles of food, were by proper labels or other means, compelled to let the purchaser know just what he is buying; and, if every advertisement for sale were required to do the same, and if official reports of proper authorities duly gave, to the public, the necessary information which is to be derived from analysis and experiment, there would be little need of other means to end these impositions and adulterations. The failure of existing laws does not prove that all laws on this subject must fail. Effective statutes can easily be framed for a system of continual inspections and for the confiscation or destruction of counterfeit, adulterated or poisonous articles. The saving to the people would be vastly more than all expenses, and the interference, with the liberty to deceive and poison, would be no interference with the real liberties of the people.

Statutes and institutions, state and national, must be framed and managed to develop the truth, regardless of the effect upon theories and systems. The day of theories, infallible which may not be investigated, is gone forever. The knowledge of the truth must be in continual progress and evolution.

Science will rise from the ponderables to the imponderables, as rises the sun from darkness and night. A glorious flood of light begins to reveal the secrets of those invisible, intangible forces and energies which no instrument can touch, which neither microscope nor telescope can find, and which nevertheless govern, with absolute sway, all material things.

The revelations of the nineteenth century, concerning electricity may be exceeded in results by the revelations of the twentieth century, concerning vitality, the principal of life in germ, in plant, in microbe and in man.

The dogmas of materialism, denying the existence of mind as anything more than the perishable result of bodily organism, must take their place with the errors of medieval superstition. The soulless science of the past must receive from on high, the breath of life. Discoveries surpassing all that have gone before are sure to come, concerning the powers of mind over matter, force and life, and requiring great changes in laws and constitutions, not only to deliver men from the ravages of contagion, but to deliver them from other evils which, throughout the ages, have been deemed inevitable and everlasting.

Changes are to come in the life of mankind, not unlike those which have come in the life of the world they inhabit; changes, such as enabled the sun to break the spell of geology's ice-age and melt away the mighty glaciers, which as they thickened and advanced, locking sea and land in the embrace of arctic death, must have seemed inevitable and everlasting, but were doomed, like many evils, to vanish before the victorious light.

THE RESTRICTION AND PREVENTION OF DANGEROUS, COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF A PHYSICIAN.

BY F. R. BELKNAP, M. D., NILES.

Disease is the fiery tongued monster that stands in the pathway of all. It strikes down the business man in the eager pursuit of financial success and it finds the scholar burning his midnight oil. It is the penalty of outraged nature, whose laws are inexorable and whose punishments are for rich and for poor alike.

Many persons apply their religious theories of foreordination to disease and say "disease, through the dispensation of Providence, exists, and it is not within the power of man to prevent or in any way restrict it;" but their thinking so, in opposition to all reason, no more makes it so, than the fact of that New York man's cutting off his toe the other day under the impressiou that he was cutting his throat, made his toe his throat.

All Gaul was divided into three parts and the life of man may likewise be divided into three parts—youth, manhood and old age. It is the design of nature that old age shall at last end in a dissolution of all that is mortal, and, as the frosts of fall precede the coming of the winter so aches and pains and all the ills of disease may precede the final end; but the normal, natural man, during youth and middle age, should by due diligence escape with few if any of the more severe diseases. It is some of the diseases which blast or kill the bud, which wither or pluck the flower of life, and which are to a certain extent preventable by means within the reach of all that now engage our attention, and which I flatter myself are worthy of your attention. These diseases are planted as is the grain in yonder field and they yield their harvest with the same certainty.

Gunpowder, with all its fearful destruction of life, has probably never wrought one-tenth the destruction that small-pox has. In Europe for centuries it constituted one of the greatest scourges of mankind. Not a decade passed in which this disease did not decimate the inhabitants of some European country, so that it came to be more dreaded than the plague. The same disease exists today, and yet how changed. It has fallen a victim to preventive medicine, and while once like a roaring lion, ran rampant throughout the earth, it now stands in fetters. Without any methods of prevention there would probably thousands die in the State of Michigan each year from small-pox, about seven or eight in Niles, while with these measures there is yet to be reported the first death from small-pox during the year 1890; and, even with these means at our command, but without the proper means for putting them into execution, such as is furnished by our State Board of Health, there would during the life time of that board have over 1,500 more deaths occurred from that disease alone.

In a contagious disease, one method of restraint is of course to avoid

exposure; but the most important method of restraint of small-pox is vaccination,—every person should be vaccinated, if they have not already had the disease, even after exposure vaccination will mitigate, if it will not prevent the disease.

Few people realize the prevalence of *diphtheria,* and fewer yet, I think I may add, realize what science has done for its restraint. Of all the communicable diseases none, save it be consumption, have a greater mortality, and yet, there are few diseases that give better results for methods put forth for its restraint than diphtheria. Statistics show that about five times as many cases occur in outbreaks where no means are used for its restraint, as in outbreaks where such means are used. There is no absolute preventive of diphtheria known among men, for the seeds may be flying in the air so that he who runs may have them planted in his throat; and yet there are means by the enforcing of which our State Board of Health has within the past few years, caused an almost incredible saving of life. In the years 1886, '87 and '88 over 10,037 cases and on an average of one and one-half deaths per day were prevented in the State of Michigan from this disease alone. For this work and its work in the prevention of all other diseases, which saves thousands of lives per year, the city of Niles pays $31.00 per annum, and in the case of diphtheria gets value received in being saved from six cases and one death. The profit of this investment is readily figured. Say the six cases cost $600 and the one life the immense sum of one thousand dollars, we have a profit on the investment of $1,569.00.

The methods for the restraint of diphtheria, such as isolation of the different cases and disinfection in all its branches, are in part compulsory as will be shown later on, and are the principal measures for its restraint. There are also certain voluntary precautions which all should observe. Avoid taking cold or otherwise causing a sore throat. Keep away from all possible sources of contagion. Do not go into a house in which the disease has occurred and which has not been thoroughly disinfected. Look out for bad sewerage, infected clothes, the sputa. Beware of crowded or illy ventilated assembly rooms.

Scarlet fever is a sister disease of diphtheria, and until recent years, was regarded as identical with it; and, even now, it is almost impossible to differentiate between the two in their first stages. Of all contagious diseases it is in some respects the most so, although one attack usually gives immunity from a second. Fully as emphatically as in diphtheria are isolation and disinfection enjoined in this disease. Scarlet fever contagion lives for years in the clothing, and may be wafted in the winds for great distances. As an element in isolation, it may be well to state that some cases give the disease as long as 80 days after the exfoliation of the skin has commenced, and that a person may take it from attending the funeral and that the case originating from a mild one may itself be a severe one. By methods of restraint, similar to those in diphtheria, the saving of life from scarlet fever each year is almost 400 in this State.

Typhoid fever.—Nestled among the towering Alps, like a bird within its mother's breast, is the little village of Lausanne, in Switzerland, which like you and me, was quietly pursuing the even tenor of its way, little known or little heeded by the world at large. Suddenly, as if a thunderbolt from heaven had done its work, about 150 of her inhabitants are stricken with typhoid fever. Science presents seemingly indisputable proof that, for every case of typhoid fever some one should be held responsible, and in this case,

as at the famous charge of the light brigade, some one had blundered. Investigation showed that the inhabitants of Lausanne obtained their drinking water from a crystal spring on the hillside. The water in this spring, fresh from the bosom of mother earth, was almost beyond suspicion, but nevertheless it was investigated. It was found that, upon the other side of the hill, a few cases of typhoid fever had occurred some time in the past. Near the locality of these cases was a stream of water which, running on, at last disappeared in the hillside. Could it be that the germs from some of these cases had found their way into this stream and from thence into the spring upon the other side? Such, by a series of experiments, was proven to be the case. Salt was put in the water of the stream and soon found in the water of the spring which was a source of the water-supply of Lausanne, whereas there was none there before. And so on with other substances, proving beyond a doubt that the neglect, on the part of some one in attendance upon those few cases upon the one side of that Alpine mountain, caused the 150 cases upon the other. The germs of typhoid fever had been transmitted in the water, and, thus it is, that the ignorance or carelessness of one may seal the doom of many. The excretions of a typhoid fever patient should be thoroughly disinfected, since, theoretically, it is only from the germs, which there exist, that typhoid fever comes; and, when once the disease has made its appearance in a community, extra precautions should be taken by well persons. Boil the drinking water. See that all surroundings are cleanly. Do not drink water with a bad taste or odor, or water from sources liable to contamination.

It must have occurred to some of you that, in a city supplied with water in the manner that Niles is, the subject is of more than usual importance. I will leave you to picture the possible results of a contamination of our water-supply with the germs of this disease.

It will surprise many to hear me mention pneumonia as one of the diseases which may be prevented or restricted by any ordinary means and yet it seems to be proven that pneumonia has two causative factors—exposure to a germ and to certain changes or states of the atmosphere.

It was at one time thought that exposure to a cold, dry atmosphere immediately after being in a warm, moist atmosphere, would cause pneumonia, but experiments failed to prove such to be the fact. Experiments in this line upon monkeys were attended by an unforseen and amusing obstacle. When brought into a cold atmosphere, the monkeys would cuddle up close, so that they kept warm, in spite of their surroundings, and thus upset the calculations of the experimenters, and rendering the results unsatisfactory. Exposure, however, in connection with the germ invariably produces the disease, while exposure without the germ, fails to do so, and it is right here that our powers of preventing it lie. Kill the germ, or avoid the exposure, and we prevent the disease. The germs are undoubtedly in the sputa, but whether in the breath or not it seems not yet settled; but one thing seems certain, pneumonia is, to a certain extent, contagious. All these diseases are, to a greater or less extent, influenced by the conditions of the atmosphere.

Other diseases might be added to this list, but it has been my purpose to take those in which we, of Niles, are likely to feel the most interest.

Concerning all these diseases, there are certain general rules and laws to be observed. The laws of our State require something of you and me, as well as the regularly elected health officer, and we should be as alert in

giving the alarm of a contagious disease, as in crying fire when our neighbors home is in danger of destruction. The law requires the physician to notify the health officer of the existence of any disease dangerous to the public health, and if he fail to do so, then the law holds you as householder or tenant, etc., to give such notice. In Niles, the proper person to notify is the recorder or city-physician. After notifying them our duties cease and theirs, which I trust will appear later, begin.

As general rules for the management of cases of any communicable disease, the following may be of value: Place the patient in a room from which all articles not necessary to the health are removed, have the room thoroughly clean, have a sunny room if possible. Receive the discharges necessary to disinfect in vessels, filled with a strong disinfectant solution or on some substance which should be immediately burned. A good solution for disinfection of discharges is sulphate of iron and for clothing a solution of sulphate of zinc, (4 oz. to a gallon of water). The nurse should be very cleanly, and in case of death the body should be washed in the zinc solution, and wrapped in garments soaked in the same. In no case should a public funeral be held. The best method of disposal is by cremation. After the occurence of a case of a dangerous communicable disease, the house should always be thoroughly fumigated with burning sulphur, allowing three pounds of sulphur to every 1,000 cubic feet of air, the house being kept closed for several hours.

In conclusion allow me to suggest to those who would know more of this subject, that they read a book called "Dust and its Dangers," by T. Mitchell Prudden, M. D., which will cost by mail, 68 cents.

RELATIONS OF PRIVIES AND CESSPOOLS TO WELLS.

BY W. I. TYLER, M. D., NILES.

Prof. Vaughan once remarked before his class, in sanitary science, that there were more people killed by poor drinking water than by poor whisky. Knowing, as we do, the the appalling effects of poor whisky upon the constitution of humanity, the truthfulness of this startling statement needs careful investigation. The subject of a pure water supply, is one that has occupied much attention for ages. Hippocrates, the father of medicine, devoted a considerable part of his writings to the importance of a pure water supply. Galen, Celsus, Pliny, Dioscorides and a host of other medical and scientific writers appreciated, and reiterated the statement of Hippocrates.

Even the most ignorant people, in the different ages of the world, have been impressed with the fact that, many diseases are due to impure water. As long ago as 2,300 years, when Athens was besieged by other nations of Greece, the Athenians believed that the plague, which broke out in the besieged city, was due to the fact, as they supposed, that the springs of water-supply had been poisoned by their enemies; and, we find even now that the people in certain portions of Pennsylvania believe that their springs have been poisoned by enemies.

To-day we are our own enemies who are poisoning our water-supply. The

ground, in our towns and villages, is fairly honeycombed with cess-pools and privy-vaults, the contents of which are constantly filtering through the soil, into our wells and menacing our lives.

There are many things, in fact, which operate in the pollution of our drinking water, but, in the case of well water, the cess-pool and the privy-vault are the most fruitful. And so long as people are ignorant of the sources of water contamination, so long will they suffer from the effects thereof.

Certain experiments have been performed, with a view of determining to what extent organic matter can filter through the soil and not lose its poisonous properties, with the result that it depended upon different things. It was found, that loam removes organic matter better than gravel, and that clay removes it still better than loam. But, when any of these soils become impregnated with organic matter, they fail to remove any more of the poisonous substances from the water that filters through it. Hence, if the soil is continually being contaminated, as we know it is, with poisonous organic substances, it fails to remove all of the morbific material but allows it to filter through into the wells adjacent.

And people do continue to pollute the soil, therefore, our well water is constantly being contaminated, and the lives of those who partake thereof put in jeopardy. It may be asked what distance will poisonous matter be carried by this filtering process? One expert has said that, water could come from an area whose radius is 30 feet. This theory has long since been exploded. Take for example: In Kalamazoo county a graveyar was to be built which, according to the opinion of some, was likely to contaminate the water of a certain well 30 rods away. An investigation was instituted. Prof. Vaughan thought the water of the well would be contaminated. Prof. Langley, then professor of chemistry at the University, being called, experimented with lithium. Eighteen days after this chemical was placed at the site of the proposed cemetery the water of the well was subjected to analysis and lithium found, proving beyond question that the poisons from the decaying bodies interred in the graveyard would, in like manner, have filtered through into, and polluted the water of said well. The same will hold true of any manner of soil pollution, cesspools and privy-vaults being the most common sources in ordinary towns. A large amount of excrementitious material, the dejections of typhoid fever patients, etc., are deposited in these vaults and their poisons percolate, through the soil into the neighboring wells.

In the city of Adrian, there was a school where there was a catch basin for pouring the slops in and catching the water from a pump that supplied the school with water. Into that hopper were poured the slops from the building. One of the boys was taken sick with typhoid fever, Some of the slops were thrown into the hopper and supposed to go, by a drain, a long distance from the premises. Very soon, about fifty cases of typhoid fever occurred in the school, and these cases could be traced to the water from that well. The slops, instead of being carried away by the drain and doing no harm, at least a portion of them, had leached through into the well. Here is one instance where forty-five or fifty cases of typhoid fever resulted from putting slops into a hopper adjacent to a well. Just such examples as this could be cited by the score. Let us study for a moment, the relation of the privy vault to the well. We see the well and privy under two circumstances; in one case the water in the well is low, in the other case it is high. It would seem, that when the level of

the water is the same in the well as in the vault, there would not be likely to be any mingling of the water from the privy with that in the well, unless the distance between them was small.

But, whenever and wherever the water in the well is below the privy not far distant, there will be a strong tendency for the fluids cast into the privy to pass downward toward and into the water into the well. And, in nearly every lot where a well is situated, you will find from one to six or more privy vaults occupying the same relation to the well, as here stated. There is a wide spread opinion that if a water tastes good, is cold and clear, it is all right, the chemist's report to the contrary notwithstanding. They forget the fact that the continued use of an impure water, while it may not produce a disease that is traceable directly to it, leaves the system in a bad condition, and weakens its powers to resist disease when it does come.

Continued pumping at a well, lowers the water level in the earth for a distance of from 100 to 1,000 feet, varying with the geological formation and water-supply. And, as has already been shown, percolation through the earth does not purify the water especially where the percolation is continuous.

The germ of typhoid fever has been traced a half mile to the source of pollution. People, then, using water from surface wells must constantly be taking into their systems these impurities and disease-producing agents, that are deposited so abundantly in the cesspools and privy-vaults, that pollute the soil drained by these wells. Some of the learned gentlemen present will tell you how to dispose of excreta so that the wells will not be contaminated. Until we have a thorough system for the disposal of waste my advice would be to refrain from drinking well water, or in case you cannot get anything else and are not sure that the water is perfectly pure, insist upon having it boiled; because these germs, about which you hear so much talk, cannot stand this stewing process, and. by subjecting them to it, at the same time you destroy their treacherous lives you take effective measures for the preservation of your own.

Third Session, Friday, February 6, 7:30 P. M.

The convention was called to order by the President. After music by the Niles quartette—Miss Mary Porter, Mr. N. Roberts, and Mr. and Mrs. John Hamilton—the following address was given:—

THE DUTIES AND COMPENSATION OF THE HEALTH OFFICER.

FROM THE STANDPOINT OF THE HEALTH OFFICER.

BY O. P. HORN, M. D., NILES.

The position of health officer of a village or city is not one of pleasure nor satisfaction, but it is one beset on every hand with trials and obstruc-

tions to the accomplishment of what is needed, what is right, and what is for the best interests of the entire population. As he looks over the field of duties, and contemplates all the needful changes which are absolutely necessary for health, happiness and prosperity, he is almost dumbfounded as to how and where to begin, knowing, as he does, that almost upon every hand, he is to be met with opposition, both loud and strong, to the changes and improvements needed.

And what are these changes and improvements for? Are they solely for his own personal health and welfare? Not by any means. If the health officer, as an individual, does not like his surroundings, he can get up and away. But it is for the health and happiness of hundreds and thousands of others who are helpless, and unable to do anything or get away from the death-dealing pestilence which prevails all around them. And, as the health officer surveys the panorama before him, what does he behold? Is it a beautiful landscape, all bedecked with beautiful and sweet-scented flowers, with its cooling brooks, its rippling streams and springs of crystal purity. The houses all neat and clean with paint or white-wash within and without. The yards and all the surroundings free from everything offensive to sight or smell. The inhabitants, neat and cleanly attired, not, perhaps, gorgeously, but presentable in all respects, regardless of the wear or tear or the occasional patch to extend the usefulness of the garments. The inhabitants,—from the aged grandfather and grandmother, down to the smallest child, are all hearty, gay and happy, with no disagreeable or unhealthy atmosphere prevailing around them?

But, alas, this is not the beautiful view that greets the eye of the health officer as he looks over the field of his future operations, where he must labor for the good of humanity. What does he see? In place of God's green earth, all bedecked with sweet-scented flowers, he sees mother earth devoid of the least vestige of grass, flowers or shrubbery. House after house, from the finest mansion to the lowest and most degraded hovel, all commingled together each seemingly struggling for supremacy in securing one ray of the world's great light, with its purifying and healthful rays and genial and invigorating warmth.

And in place of the babbling brook, the rippling streams and crystal fountains, we have stagnant pools, foul cisterns and wells, whose waters are the home of millions of impurities, which readily find a place in the human system, to create sickness and death. The question may be asked, is the water of all wells so impure or impregnated with the germs of sickness and death, that it is unsafe to use it to quench our thirst, or cook our meals? We would answer no, not by any means. It is the source, from whence it comes, and the general surroundings. To be pure, a well must have a sufficient depth; and, the streams from whence it comes, must be sufficiently strong to keep up a full flow of water. And not only this, but the immediate as well as the remote surroundings, must be taken into consideration, the close proximity of privies, water-closets, pig pens, stables, etc. And, as to remote causes of contamination of our water-supply, we must first consider the situation,—high or low grounds. If the head or source be on high commanding ground, the purer and more healthful will be the water. Those wells or springs on a lower plane, are more liable to be the receptacles of filth and impurities from the water-closets, pig pens, stables, etc., which are on a more elevated plane, directly above, although the distance which intervenes may be great. And, here is where the great importance and advantage of sewerage comes in, to protect the wells and

water-supply of the lower residents from the contaminating and evil influence of the refuse matter from above.

As to our water-supply, it is abundant and, generally speaking, of a very superior and healthful character. It consists of many fine wells, and among which are some of an artesian character, situated on high, commanding grounds, and whose water is of a magnetic quality. And, besides these fine wells, we have the water of Barron Lake, which is of the purest and finest quality. And for purifying and carrying off waste matter, etc., we have the beautiful St. Joe river, running directly through our city, bearing upon its mighty bosom, into the great lakes, much of the refuse matter of the city.

And again, what does the health officer find on his inspection tour? He finds, on and around the lots and houses which constitute our towns and cities, many things which are deleterious to health and happiness; in many instances pig pens with from one to a dozen hogs or pigs, that can hardly breathe on account of the accumulation of filth. But not only this; as he approaches the privy or water-closet, he beholds a sight more fearful and repugnant than all else. The ground, for yards around the privy-building, is covered with a greasy, soapy-looking fluid which is the overflow of the privy-vault; and the rickety building situated in the midst of the sea of filth appears to be nervous and ready to fly from the upheaval of the surrounding matter and noxious gas. And again, we have seen stables occupied with horses and cows, so close to the dwellings that one can stand in the kitchen door and take the cow by the tail. Houses and barns arrayed in this close proximity may be very convenient for the good old lady to sit in her kitchen door smoking her pipe, and milk the cow in the stable; but surely it is not good for health or the organs of smell.

These, with many other things unsightly and unhealthy, do we find in and around the premises of many persons. And when, by reason of these obnoxious, unhealthy and unbearable conditions of things, the health officer is called to inspect and abate the nuisances and stop this great source of sickness and death, is he received, by the inhabitants of these premises, with open arms and a cordial welcome? No, not so. Instead of open arms and welcome hand he finds closed fists and dark, portentous frowns and, who in thunder-like tones, demand the object of his visit. And, when told the object of his visit, the owner or occupant of the property becomes greatly exasperated, because he thinks his premises are the essence of purity and sweetness, and they exclaim, in no friendly or modulated voice that, it was owing to the McKinley Bill or to McGinty's big mouth that has brought this disgrace upon them, " and, faith, they had better look after their own affairs, for I know it was them that made the complaint and sent you up, Mr. Health Officer."

These people are reasoned with, and the evils pointed out to them, but it is of no avail. In the face of everything they still contend that, the sweetness of the last rose of summer still lingers on and around their premises. And what then? The kindly words of admonition and earnest appeals of the health officer for purity and cleanliness are all unheeded. And, then, there is nothing left for the officer to do but to resort to other means, more harsh and unpleasant, to cause the abatement of these evils which are constantly sending forth the poisonous gases to afflict and destroy mankind. Oh, then, what a purgatory of curses are heaped upon the head of the officer for simply trying to do his duty, and save humanity from sickness and death.

And not only is it the duty of the health officer to look after all nuisances complained of throughout the city, but, also, to keep track of all contagious diseases, and make weekly reports to the State Board of Health to keep them posted as to the health and sanitary condition of the city. And what pay or remuneration does a health officer get for all the time he spends, and for the labor he performs, and for the curses and ill-will bestowed upon him in the performance of his duty which is for the good of all? We answer, it is precious little. Therefore, in conclusion, may we not ask, are the duties and responsibitities resting upon a health officer properly appreciated and rewarded?

PREVENTION OF DISEASES OF THE EYE AND EAR.

BY F. N. BONINE, M. D., NILES, MICHIGAN.

The subjects I will endeavor to deal with, namely, the eye and ear, although not occupying much space in our bodies, are very important members, susceptible to various forms of disease, some of which may be prevented by proper hygienic measures.

The eye especially, the organ of our most important sense, requires such strict attention, nature helping us to a remarkable degree with delicate muscles around the eye, whereby objects are met with the "swiftness of a wink;" thereby particles flying in the air are arrested before entering and causing irritation.

The secretion of the ear, acting in a similar manner, protects the delicate ear drum by the particles being caught and held fast in its sticky substance. As the ear is so intimately connected with the throat, it will be best to confine myself to the eye and its characteristics.

I have a few diagrams* showing the eye to such an advantage that we may get at the subject in an understanding manner; practically a camera with lens, curtain, sensitive plate, etc. The eye, however, from a mechanical point of view, is not as perfect as the camera; owing to the one spot of focus, the exact focus of the eye being limited, in the camera it is not so much so, the camera focusing accurately. The eye depending upon our power of perception for surrounding objects. To demonstrate, lines constructed in this manner would be photographed as they actually are, but, to the eye, they look anything but parallel and perpendicular, converging or diverging as the case may be, showing perception is not always to be depended upon.

A few words with reference to hygiene of the eye in schools; these views are elementary, and should be observed widely, in every school:—

1. Strict introduction, both in school and at home, of prophylactic measures with regard to the light, school furniture, methods of writing, and character of print, etc.
2. Education not to begin to early.

* The diagrams which so graphically illustrated Dr. Bonine's address "The Prevention of Diseases of the Eye and Ear," were left in the opera house, and were destroyed, and therefore are not reproduced in this publication.

3. Suppression of fatiguing work at short distances, as drawing, etc.
4. That each should write legibly.
5. The teacher should be able, in some way, to test each pupil's sight on joining school, so that if need be, active steps could at once be taken.
6. Extreme caution must be taken with contagious diseases, that they may be eradicated from the school at once; some diseases of the eye are so highly contagious that an entire school has been made to suffer because of lack of precaution; and a pupil, once sent out of school should not be returned, only upon positive knowledge that he has entirely recovered.

One means for the prevention of myopia, or near sight, in children, is a change in the manner in which they study. At the meeting of the International Society of Physicians and Surgeons, in Berlin, the leading occulists decided that, as so much trouble to school children's eyes is caused by poor accomodations, the use of a desk, as specified below, is to be recommended:—

1. The seat must be of such height as to allow the pupil's feet to rest flat on the floor, and broad enough to support the greater part of the thigh.
2. The seat must have a back placed at such a height as to fit the back below the shoulder blades and support the body in a vertical position.
3. For use in writing, the desk should have a slope of ten to fifteen degrees; in reading, forty-five degrees, and must be at a distance of at least twelve inches from the eye but sixteen inches is better.

The pupil should not stoop forward so that the support of the back may be maintained. The desks of course, are made of different sizes in order to accomodate pupils of various ages.

The conditions which lead to myopia do not exist at school alone, but at home as well. In Germany the legal age to send a child to school is seven years, which law should also be adopted in this country; and even then the child should have very little near-work, and should be taught principally by blackboard or wall diagrams.

Pardon me for taking up some of your time with diagrams, but the subject of refraction is so important to us all, from a personal stand-point, that a few words might prove of benefit.

As a rule, we must all seek artificial means to aid our eyes, when the muscles of accomodation fail to obey our command. We begin holding our reading, etc.; away from us to get a distinct object or focus and wonder why this is necessary. As the muscles controlling the action of the lens become sluggish, the mechanical action of the lens (more or less convex) is in a measure destroyed, and in this case not convex enough to give us a near focus. Thus we have aching, burning, scratching sensations, accompanied with headaches, etc. These symptoms should be met by consulting an optican as to lenses, especially if the age be above forty years.

Eyes are treated by two kinds of lenses in refractional errors—concave and convex; lenses are again classified into cylinders, for correcting one diameter singly or in combination, as eyes are sometimes found very irregular in refraction. Probably one of the most interesting cases I have seen, was that of a lady from a neighboring city, having eyes so distinctly different in refraction, that one was near sighted or myopic and the other far sighted or hypermetropic—this, however, is an exception.

The question is often asked, why do so many young people wear glasses? It is the lack of proper hygiene in a great many cases, as the majority of those that wear glasses are myopic or near sighted—a progressive disease.

The fitting of lenses to children has, in numerous instances, proven of great benefit in my own observation—one child going from an intermediate, to a high standing in its classes at school. Being young does not exempt one from wearing glasses by any means. If we have an eye that a lens cannot help, there is something wrong with other portions of that eye—the result of disease, acute or chronic, or the result of some old treatment.

It has been quite customary, both in the profession and out of it, to treat most all diseases of an inflammatory nature with lead, zinc and silver washes, which without a perfect knowledge of the existing trouble, never should be done; for in numerous troubles, the delicate coverings of the eye will be laid bare, and expose raw surfaces, and it is as simple to tattoo an eye, or any nude surface in this manner, with the tattooing needles. Ulceration of the cornea, or front transparent portion of the eye, is often mistaken for some other disease, having symptoms in common with it; and it is frequently seen that small spots or large opacities remain as the "result of the attack." Investigation will show "opacities" due to some one's favorite eye-wash with sugar of lead in it; and now the eye is beyond the help of man or his regents—it cannot be bettered. Does not that come under the head of sanitary science —to prevent as well as cure?

How often we see people with granulated eyelids, where the white portion of the eye and under surface of the lid are stained blue to black with nitrate of silver. There being other and better ways to treat this disease, much less painful, why should silver be used?

As to diseases of the eye requiring surgical interference, there is none so satisfactory as the operation for cataract, or complete opacity of the crystalline lens. After the lens has become perfectly opaque, the operation consists in opening the ball and by certain prescribed methods, extracting the lens from the eye, restoring sight at once; and after the wound heals, a substitute, in the form of a convex lens is brought into use, being placed before the eye as ordinary spectacles. This condition exists only in persons above thirty-five years, as it is most commonly a disease of old age; and you will see a great number of patients are over eighty years at time of operation. The operation is so very much improved of late due to hygienic precautions so as to be nearly always successful. This operation is undoubtedly one of the greatest satisfaction, both to patient and surgeon—literally making the blind see.

I have two cases here to exhibit, which can be examined at your pleasure, and both gentlemen would be pleased to give you the *modus operandi* from their point of view.

Mr. Henry Pratt has been going blind for years, and was so much so for over a year before his operation, as to be unable to get about to any extent; and owing to the best hygienic measures on his part, we were able to operate on the second eye six weeks after the first one was operated upon. The success of this operation, to a certain extent, was due to his perfect willingness to follow minutely, every direction.

Mr. James Smith has both lenses removed, and, owing to there being a complication of diseases, the second eye was not operated upon until nearly a year after the first one. Both gentlemen, having the required convex lenses, can see at a distance, as well as close by.

In conclusion, a few precautions might be observed for the welfare of the eye. The use of tobacco is certainly contra-indicated as it affects the nerves very materially, all other arguments to the contrary.

In the Moorfields' Hospital, London, I saw a sailor just returned from

a long voyage to Cape Horn. On the return trip the ship's progress was so delayed that it required several weeks to reach port. Owing to this delay, the sailors were placed on low diet, and on his arrival, the patient was nearly blind. Examination revealed great white spots in the inner portion, of the eye, which was perfectly blind. The patient had had a pipe in his mouth most of the time; he was advised to leave off smoking, which he did and improvement began at once.

A rather amusing incident occurred some time ago. I endeavored upon several occasions, to adjust a pair of lenses to the eyes, of a gentleman in the city, with rather indifferent success. Questioning elicited the fact that "well, I do smoke some, several cigars a day—eight or ten may be." I suspected something of the kind, and stated to him the result of this terrible abuse, not only to his eyes but to his system in general, and when he walked to the window and tossed a half burned cigar away, I felt as though I had done a fellow creature some good.

In throwing away the cigar, he remarked, "there goes my last cigar." I assured him of rapid recovery of sight, and with the understanding that he was to be up soon for another test, he departed. Imagine my surprise, two hours later, on seeing the gentleman in question, standing in the door of a cigar store enjoying—a very strong cigar.

THE CARE OF CHILDREN DURING HOT WEATHER.

J. S. PARDEE, M. D., THREE OAKS, MICHIGAN.

Two-fifths of the deaths, in the human race, are of children, before reaching the age of five years. Nearly one-fifth of these early deaths are caused by bowel troubles. And 70 to 80 per cent of all the deaths from bowel troubles occur between the first day of July and the last day of September.

These general conclusions are substantiated by mortuary records. Take those of our own state for example. During the five years ending Dec. 31, 1876, there were 64,695 deaths from all causes, of which 26,673 or 41.23 per cent were of children under five years of age.

The next period for which I could obtain the statistics was the three years of '86, '87 and '88. The total number of deaths for this period was 59,433, of which 22,926 or 38.57 per cent were under five years of age. And for the eight years considered, these figures show 39.96 per cent, practically 40 per cent, or two-fifths, of the total number of deaths to be of persons under five years of age.

The reduction of the death-rate of children under five, from 41.23 to 38.57 per cent ought not to be passed by without notice, for it is undoubtedly the direct result of the persevering work of the State and local boards of health. That this lessened death-rate is not the result of accidental causes, is shown by comparing the percentages for each of the years.

The percentages of deaths under five years:—

In 1872	was	41.5	average per cent 41.23.
" 1873	"	42.0	
" 1874	"	41.1	
" 1875	"	41.5	
" 1876	"	40.7	
" 1886	"	38.0	average per cent 38.58.
" 1887	"	38.8	
" 1888	"	39.0	

The yearly variations during the first period from 1872 to 1876 were from 40.7 per cent the lowest, to 42 per cent the highest, or a fluctuation of 1.3 per cent. In the second period the yearly variations were from 38 per cent the lowest, to 39 per cent the highest, or a flunctuation of 1 per cent. While the lowest percentage in the first period 40.7 per cent was 1.7 per cent higher than the highest percentage in the second period 39 per cent. These figures show conclusively that the difference is too great to be accounted for by accidental variations. They show that a new factor has entered into the production of mortuary statistics; and close scrutiny of the general statistics show that this new factor is the intelligent disinfection of, and quarantining against contagious diseases. Dr. Baker has shown that since intelligent quarantining and disinfecting have been practiced, over eleven hundred lives per year have been saved from death by diphtheria, scarlet fever, and small-pox. These are grand results, but there will be still grander results when the State Board of Health's "campaign of education" shall have reached the whole community as thoroughly as it has already reached the reading and thinking part of each community today. The good work has only just commenced and the saving of "over three lives a day," is only the first fruit of their labors. These facts ought to be known and appreciated by every father and mother in Michigan. Then every householder would be an efficient health officer, and deaths from contagious diseases would be reduced to a minimum. While I realize that this has been a digression from the main subject, it is simply a side light on the statistics presented, and its importance is a sufficient excuse for bringing it in here.

The second proposition was, that one-fifth of all the children who die, under the age of five years, die of bowel troubles.

In the eight years under consideration, the total number of deaths of children under 5 was 49,599, of which 9,693, or 19.34 per cent were caused by bowel troubles. This is not true for each year, nor is there any such regularity in the percentages representing these deaths from bowel troubles, as was found in the percentages representing the proportionate deaths of children under five. You remember that the greatest yearly variation found was 1.3 per cent. While in this case the variation is from 24.68 per cent in 1872, to 17.33 per cent 1875, or a fluctuation of 7.35 per cent. This great yearly variation in the death rate from bowel troubles is worthy of being remembered, for it shows that there must also be a correspondingly great variation in the causes which produce these deaths.

The third proposition was that 70 to 80 per cent of all the deaths from bowel troubles occur in the months of July, August and September. The number of deaths from cholera infantum, diarrhoea and dysentery for '86, '87 and '88, (the last three years for which the statistics are published), was as follows:

January	44	July	689
February	44	August	1,153
March	49	September	847
April	62	October	298
May	104	November	95
June	171	December	88
Total			3,644

These deaths by quarters are, for the first quarter 137; second quarter 337; third quarter 2,689; fourth quarter 481—total, 3,644.

Out of the 3,644 deaths, 2,689, or 73.79 per cent, died in July, August and September.

In the years '72, '73 and '74 the deaths from the above causes were as follows:

January	29	July	464
February	36	August	1,055
March	39	September	814
April	56	October	327
May	67	November	100
June	117	December	66
Total			3,169

These by quarters are, for the first quarter, 104; second quarter, 240; third quarter, 2,332; fourth quarter 493. Total, 3,169.

Out of the 3,169 deaths, 2,332, or 73.58 per cent, died in July, August and September.

These are the statistics from the generally neat and airy homes of Michigan. Not of some metropolitan city with its vast number of tenement houses, reeking in filth and filled to overflowing with ignorant, vicious, half clothed, half starved people, where during July, August and September deaths from bowel troubles make up from 50 to 75 per cent of the total deaths. Neither do these statistics show the vast number who suffered from bowel troubles. Only the number of actual deaths are recorded here. These are cold facts and do we appreciate them? When I read to you that in 1888, 1,183 little ones died from diarrhœal diseases do you see anything more than those inexpressive figures? Do you see the little ones they represent? If you went, in imagination, to the separate homes where each of these little ones lay cold and stiff, with dark circled, sunken eyes, hollow cheeks and pinched, drawn lips, that even in death admonish us of what they had to suffer; and if you have little ones at home who are in danger of being tortured—even unto death—by this malevolent *something* that roams about the earth during dog days, then you are thoroughly convinced that this subject of the "care of children during hot weather" is worthy of your most careful study.

In the study of any disease the most important thing is to find its cause. But this is often a very difficult matter, and what by one generation are considered as the principal causes, are regarded by the next as having but little or no influence whatever in the production of the disease.

In looking over an old book on the practice of medicine, I find laid down as the principal causes of diarrhœa in children, teething, gout, rheumatism and fever. All of which, with the exception of teething, were long ago rejected as having no influence whatever in the production of diarrhœal diseases. A later generation of medical writers considered indigestion to be the immediate cause of catarrhal irritations and excessive evacuations; while the indigestion is in turn regarded as the result of improper feeding, adulterated milk, or milk of a poor quality, impure air, teething, or over-worked or unhealthy mothers. Undoubtedly all of these causes are often the occasion of gastric and intestinal derangements. But a more careful and extended study has shown that none of the causes enumerated exert more than a minor influence in the production of so called summer complaint of childhood. A little attention will show that the

errors in feeding infants, the adulterations of milk and the effects of bad ventilation are causes that are as active in the winter as in the summer months. Also, that as many children are cutting teeth in January as in July, and that there are no more over-worked, under-fed, and unhealthy mothers at one season of the year than another. Then it follows that, if any or all of these agencies were the main or controlling influences in the production of diarrhœal diseases, there should be no marked variation in the number attacked at different seasons of the year. But you will remember, that in the last three years, for which the statistics are published, there died from cholera infantum, diarrhœa and dysentery 137 during January, February and March; 337 during April, May and June; 2,689 during July, August and September; and 481 during October, November and December; showing conclusively that whatever the cause or causes of these diseases are, they are only active during the ninety days following the first day of July.

Physicians, in the active practice of medicine, have kept an accurate record of the date of commencement of all cases of diarrhœal diseases they were called upon to treat, with the meteorological conditions of the atmosphere, and these statistics establish the following facts:—

That there was no marked increase in the number of children attacked with diarrhœal diseases until after a prolonged hot wave; where the temperature was high, continuously, day and night for five days and nights in succession, and with the temperature at night not falling below 70° F.

That, if the continuous high temperature did not last more than three days, there would be very little increase in the number attacked with diarrhœal diseases; but if the hot wave continued for seven, ten or fourteen days, it would vastly increase the number and severity of the attacks of diarrhœa. And, if in addition to the high temperature, the air was still, from lack of winds or from obstructions as in compactly built cities, or stagnant from the lack of ventilation of dwellings, the bad effects were greatly increased.

That summers, in which the periods of continuous high heat did not last more than three or four days, have been uniformly accompanied by a low rate of infant mortality from bowel troubles.

That in most seasons there will be from one to three of these periods of continuous high heat, lasting from five to seven days, and that each of these periods will be followed by its proportionate number of bowel troubles.

That in some seasons one of these hot periods has commenced the last of June or first of July and continued practically without intermission for two or three weeks, and that such seasons have uniformly had a high rate of infant mortality from bowel troubles.

The statistics, which are the basis for the above conclusions, thoroughly demonstrate that the two principal causes of infantile diarrhœal troubles are a continuous high temperature and impure air.* The next question is, are there any known laws of philosophy and physiology that will enable us to determine definitely the effect of these morbific influences on the human system, and thus enable us to understand accurately how and why continuous high heat and impure air should be the cause of such disastrous results in childhood?

*[Statistics compiled by Dr. John Tatham, medical officer of health of Salford, England (*The Sanitary Journal, July, 1891*), prove that, in thickly-settled districts, where the houses are built back-to-back, so that there is no possibility of ventilation between them, the death-rate from diarrhœa is more than double that in districts where the houses are not so constructed. *H. B. B., Sec. State Board of Health.*]

We have the physical law that the higher the temperature of the air the rarer it becomes and the less oxygen it contains in each cubic inch. And although the difference in the amount of oxygen contained in a single cubic inch of air at 65° F. and 85° F. may be slight, when we consider that a child inhales and exhales in each twenty-four hours from one quarter to half a million of these cubic inches of air, we can readily see how this slight difference may become an important factor, especially when it is continued for several days in succession.

Right here we see the bad effects of deficient ventilation, or of a still and stagnant atmosphere which practically prevents the proper ventilation of our houses. The exhaled air that has lost a portion of its oxygen and is impregnated with organic impurities that have been thrown off through the lungs, is not carried away by atmospheric currents as it should be, but is diffused in a small space about the person, ready to be again inhaled, lose another portion of oxygen and be further loaded with organic impurities. I have no doubt that most of us have gone into poorly ventilated sleeping apartments or sick rooms, where this process of absorbing the oxygen and loading the atmosphere with organic impurities had been carried on until the filth seemed to come out of the door to meet us, and we went in against the express warning given us by our noses that there was danger ahead.

It is a known physiological fact that the power of the blood to take up oxygen depends largely on the proportion of saline elements it contains; and under a continuous high temperature the increased perspiration on the surface of the body diminishes the proportion of free salts in the blood and thereby lessens its capacity to receive the oxygen from the air cells in the lungs in exchange for the impurities in the blood. And all know that none of the functions of the body can be kept up to the normal standard without the proper purification of the blood in the lungs.

Again it is a physiological fact sustained by all our individual experience, that a continuous high heat relaxes the general tonicity of all the structures of the body and increases their excitability or susceptibility to external impressions, while it deteriorates all of their functional activities. At the same time that the relaxed condition of the blood vessels on the surface of the body is producing such a copious perspiration, the same relaxed condition of the blood vessels of the alimentary canal is producing an increase in the watery elements of the gastric and intestinal juices, deteriorating their quality and diminishing their powers for digesting foods.

Thus a careful analysis made in conformity with known laws of physics and physiology has enabled us to see clearly the exact condition produced by these protracted periods of hot weather. These conditions are, a morbid sensitiveness of the mucus membrane of the alimentary canal, with an impairment in the quality of its digestive fluids, and such a relaxed condition of its blood vessels as directly tends to increase the exudation of the serous elements of the blood.

All grades of this serous exudation are met with from that which simply causes a slight looseness of the bowels to that which is so copious as to rapidly exhaust the watery elements and salts of the blood and produce a fatal colapse in a few hours. With such a condition of the alimentary canal, you can readily see how improper feeding would produce serious results. For any food that from its quality was indigestible, or that owing to its quantity was in excess of the powers of the system to digest it, would

irritate and decompose, perhaps producing poisons of sufficient virulence to be dangerous to a strong, healthy child.

Now if these views are correct, and we firmly believe them to be so, regardless of what the next generation of physicians may teach, they clearly indicate what is necessary to be done to best protect our children from the ravages of this class of diseases:

First, See to it that they are given every opportunity possible, for securing the amount of oxygen necessary to keep their blood purified during both nights and days. This can be done by keeping the rooms that the little ones occupy thoroughly ventilated. By taking them out of doors into the coolest and most airy shade possible. And during those exceedingly hot, sultry periods, when it seems almost impossible to find a fresh breath of air anywhere, with a fan in hand, take a position by the side of the hammock, when you have a good place for a hammock, and and if not, in front of the coolest door or window that the house affords fan the little one constantly during its afternoon nap, or in the fore part of one of those oppressively hot nights. Busy mother, do not tell me that you cannot take the time, that you cannot better afford to spend two or three solid hours during each of those hot, sultry days, fanning your little one while he sleeps, than you can to spend days and perhaps weeks, a little later on, faithfully attending to the little sufferer's wants. The first is the veritable "ounce of prevention" that is worth more than the "pound of cure."

The second indication is to use such means as will best prevent the heat in those protracted periods of continuous high temperature, from producing such a relaxed condition of the blood vessels, of the mucous and cutaneous surfaces of the body, as will permit of the pouring out of the watery elements and salts of the blood. To accomplish this there is no other means that is so efficient as the judicious use of the sponge bath. If, during the periods of high atmospheric temperature when the mercury did not fall below 70° during the nights, mothers and nurses would see to it that each of the little ones received a free bathing with water, as cool as is comfortable, both morning and evening, it would greatly lessen the number attacked with diarrhœa.

The third indication is to carefully look after the quality and quantity of the food that the child eats. See to it that they are of the most easily digestible kinds, largely liquid, such as good fresh milk, meat broths, and gruels, and that the quantity is such that the child will certainly not be overfed. Do not forget that at such times these little ones want water often, and do not allow them to take milk or liquid food when they only need a drink of water.

Last, but not least, do not be misled by any would-be oracle of the neighborhood who will tell you that these diarrhœal troubles are caused by teething and that nothing can be, or ought to be done, to check them, unless they get very bad, and that then it would be wrong and dangerous to entirely stop the diarrhœa. Persons who preach this doctrine are to be found in nearly every community, and through the influence of such teachings, many a child has been neglected, until after the production of an irreparable exhaustion. Call in a physician at the very commencement of the trouble and see that all is done that can be done, to prevent the case becoming a serious one.

I look forward to the time when in many of our homes we will be enabled to draw air from above the house top, through an impervious tube

to our basements, there cool it to the desired temperature, and then force it up through our furnace flues to ventilate and cool our sleeping and living rooms. This could easily be done by means of ice and of a fan operated by a small electric motor or by a little water wheel attached to the hydrant.

Then the weakly ones could be as well and as comfortably cared for, during the hot periods, as they can be now during the cold blizzards.

THE WATER-SUPPLY OF NILES.

J. H. RICHARDSON, M. D., NILES.

The gentlemen of the committee, to whom I am indebted for having assigned to me the topic "The Water Supply of Niles," were no doubt influenced in their selection by the fact that for several years, I was engaged in the water business (sometimes in very hot water), and not from any supposed ability to do justice to a subject of such magnitude and importance.

The details of scientific investigation being uninteresting to the average audience, only a few of the results of such inquiries will be presented, and thoughts suggested by the subject.

Water, so essential to the existence of animal and vegetable life, has received the marked attention of man from the earliest period of the world's history, of which we possess any knowledge.

That the vital importance of securing an ample supply of water has been recognized by all the nations of the earth, the vast water-ways and aqueducts, those enduring monuments of the patience and skill of the Romans, and older nations of the old world, and the wonderful reservoirs hewn in solid rocks hundreds of feet above the streams that flow at their bases, by the Cliff Dwellers and Aztecs on this continent, afford ample evidence.

It is more than probable that many of the ancient cities of the world owed their location if not their existence to the fact that some roving tribe had pitched their tents beside a spring or well in their vicinity, where eventually permanent settlements were established. There is a tradition extant, that, even the earlier settlers of Kentucky built their cabins near springs of water.

In the direction of sanitary science, greater progress has been made than in many other lines of modern research. The beneficial results to the human race from such investigation can only be measured by the extent to which man has received the truths revealed by science, and has appropriated and applied such knowledge. Dr. Ed. A. Parke, in his "Manual of Practical Hygiene," says: "In all sanitary investigations the question of water-supply is one of the *first* points of inquiry, and of late years quite unexpected evidence has been obtained of the frequency with which diseases are introduced by the agency of water." With the ordinary articles of food consumed, greater care is taken to ascertain its wholesomeness and purity, than with the water drank. In the examination of food, the senses may generally be relied upon to detect conditions or qualities which would render it objectionable, except in cases where poisonous ferments or ptomaines are present, which are sometimes developed in cheese, canned

meats, stale milk, etc., and which are only recognized by their direful results when eaten, or by chemical research. To Prof. Vaughan the world is indebted for the isolation of this poisonous principle, by him named tyrotoxicon. Realizing the importance of water as an article of food, for without water no food can be assimilated, no waste repaired, and no effete matter excreted. When it is remembered that, through the agency of water, the most subtle poisons and germs of malignant disease are introduced into the system, should it not be a matter of primary interest to all communities to secure a supply of pure water, and then to exercise the greatest possible care to prevent its pollution?

The history of epidemics furnishes the evidence that such care is not always exercised, and that people as a rule, pay but little attention to their drinking water, until its impurity becomes apparent by its color, taste and smell, or until the ravages of an epidemic of typhoid fever, or other disease, compels them after a vain search in other directions for the cause, to direct attention to the water-supply. This is especially the case where the supply is obtained from wells.

That a matter so intimately connected with the mortality and material interests of any locality, as the water-supply, should be neglected, cannot be wholly attributed to ignorance, but rather in part to erroneous beliefs and prejudice, and in more instances to indifference. It is a characteristic of man, to cling with great tenacity to opinions and beliefs, which he has long cherished. One of the beliefs with which he is imbued, is that the Creator has endowed him with faculties, which enable him to select from the bounteous supply, which nature has provided for his use, those which are good and healthful, and to discard those which are hurtful. The fallacy of such beliefs are at once apparent, and particularly is it so, when our unaided senses are relied on to decide upon the purity of water.

Who has not seen the man whose boast it was, that the water from *his* well, was the standard of excellence and purity? It was free from odor or taste, it was sparkling, refreshingly cool, and quenched thirst.

These are the tests to which water is usually subjected to determine its purity. What more could be desired? Good water should possess these qualities, but these alone are not sufficient. When apparently pure water is examined, by that wonderful instrument, the modern microscope, it may reveal the presence of living organisms or germs which when taken into the system multiply indefinitely, and if not the immediate cause of disease and death, may so impair the health and vitality as to make life a burthen. Such water, when subjected to the re-agents of the chemist, may be found to contain poisonous principles in their most dangerous form.

These microscopic hosts of pestilence that no man can see, that the marvelous instruments of modern science have only begun to detect and arrest, are at once the most numerous of living things and of all deadly agencies the most destructive. It is against all the detected, and now overmatched foes of the human race, that our "State Board of Health" is waging a relentless war.

Is it not strange that so few are willing to join in a crusade that appeals to the deepest feeling of self-interest in every human being? In some locations a belief is entertained, that wells and springs should have special guardians to preserve their purity, and frogs and crawfish are placed in them for that purpose; by others, aquatic plants are deemed essential for the same reason. The fact that such animal and vegetable life is sustained by food, and that such food is largely the result of decomposition

of organic matter with the resulting excreta, appears to have been overlooked.

There exists, very generally, a belief that the greater the quantity of water drawn from a well, the greater its purity. A little thought will convince any one of the error and danger of such belief. Since a definite distance, from which water is drawn or drained to supply a well cannot be accurately fixed, that depending upon the character of the soil, it follows that, the larger the demand made upon a well, the greater the area drained, and should the level of the water be low from drought, the more concentrated would be the contamination if the conditions were favorable. To make this proposition clear and intelligible, I quote from J. H. Shephard's admirable paper read at Ypsilanti. "It has been demonstrated that, in soils somewhat similar to ours, the level of ground water is lowered for a distance of 200 feet in all directions from the well, while under favorable conditions the circle of influence may have a radius of over 2,000 feet" —Nichol's Water Supply. Now for the sake of illustration, let any owner of a well in this city take a line 200 feet long and, with his own well as a center, let him strike a circle, then let him count the privy vaults, old and new, cess-pools, stables and other sources of pollution within that circle; then may he know, approximately, upon how many reservoirs of death he is drawing when he works the handle of his pump.

Another error of belief more dangerous because more generally entertained, is in regard to the purifying influence of the soil itself as a filter, and that any form of filth or sewage if buried in the earth is effectively disposed of and beyond the power of doing harm. The filtering power of soils varies necessarily with the character of their formation. A loose, coarse sand, mixed with gravel, will extract but little of the venom from polluted water, even though it percolates through it for a great distance. It may arrest and retain organic particles held in suspension, but the pollution flows on and on to its ultimate destination, unless perchance it is arrested in its course by the walls of a well into which it pours. It is needless to tax your patience with the exhaustive experiments which have been conducted by individual effort and under National auspices to establish the fact that sand interposes no protection between our wells and the "contamination of privy vaults, cess-pools, cemeteries and other sources of pollution, even though lying at a great distance in the lower wet stratum of sand."

In the investigation of the causes of disease, it has been demonstrated beyond the possibility of successful disputation, that typhoid fever and cholera are disseminated through the medium of water. In verification of this statement, and for the information of the non-professional portion of the audience. I will briefly refer to two of the most noted and frequently quoted epidemics of typhoid fever, namely: that of Plymouth, Penn., 1885, and Lausen, Switzerland, 1872, as best illustrating the subject.

The inhabitants of Plymouth, Penn., obtained their supply of water from a rapid mountain stream. About two miles above the water company's reservoir, near the stream lived during the winter of 1885 a family, a member of which, had typhoid fever. For two months the discharges from this patient were thrown out on the snow near the stream. The weather was intensely cold, and the germs in the excreta were subjected to a frigid temperature. The first thaw in the spring, washed the snow with all its impurities, into the stream, and about two weeks from that time, one of the most virulent outbreaks of typhoid fever that ever scourged a

community in modern times, occurred among the people who used that water. Twelve hundred cases of that terrible disease, and some two hundred deaths were recorded, in a town whose population was about eight thousand.

The experience of Lausen is of much more importance than that of Plymouth, for the reason, as will be seen, that the question of purification of water by filtration is involved, and the distance of filtration through soil which may be necessary to purify contaminated water. In this case the germs of typhoid fever were transmitted in the water through nearly a mile of porous earth. The following extracts are from a communication by Prof. Frankland:

"The outbreak of typhoid fever occurred in the village of Lausen near Basel in Switzerland, and it was exhaustively investigated by Dr. A. Hagler of Basel. The source of the poison was traced to an isolated farm house on the opposite side of the mountain ridge where an *imported* case of typhoid fever, followed by two others, occurred before the outbreak. A brook which ran past this house received the dejections of these patients and their linen was washed in it. This brook was employed for the irrigation of some meadows near the farm house, and the effluent water filtered through the intervening mountain to a spring the water from which was used by all the houses in Lausen except six, which were supplied with water from private wells. In these six houses no case of typhoid fever occurred, but scarcely one of the others escaped. Not less than 130 or 17 per cent of the whole population were attacked, beside fourteen children who received the infection while at home for the holidays and who afterward sickened on their return to school. The passage of the water from the irrigated meadows to the spring at Lausen was proved by dissolving in it 18 cwt. of common salt, and then observing the rapid increase of chlorine in the spring water, but the most important and interesting experiment consisted in mixing uniformly with the water several hundred pounds of flour, not a trace of which made its way to the spring thus showing that the water was *filtered* through the intervening earth and did not pass by an underground channel."

Prof. Kedzie commenting upon the occurrence says: "The full details of this remarkable outbreak of typhoid fever will be eagerly sought by sanitarians. If a mile even of porous earth is not an adequate sanitary filter, can we safely rely on a few feet or even rods of any kind of soil as an effective sanitary filter to arrest disease germs or infectious poisons?"

To these two remarkable instances might be added many others. Notably the outbreak in a small village near Buffalo, related by Prof. Austin Flint, the outbreaks of Neuchatel, Adrian, etc.

In our own State during the present month, from a certain point in a not distant city, might be seen at one time several signs bearing the legend "Typhoid Fever." Is the cause known? Yes, the use of polluted water.

Cholera, whose birth place is India, first makes its appearance among the devotees who annually make pilgrimages to the river Ganges, whose sacred waters it is their belief they must not only drink but bathe in also. Their religious rites performed, they disperse in all directions, disseminating cholera along the highways, the scourge marking the lines of their progress. Wells being infrequent in the east, the pilgrims gather by thousands about them, where they occur, to replenish their vessels and

to perform their ablutions. Thus the process of pollution is repeated with the inevitable result.

The investigation of Dr. Snow, and others during the epidemic of cholera in London in 1848, proved conclusively that in a certain district the disease was disseminated from a well which had been contaminated. Instances might be cited indefinitely of similar character. The labors of scientists in this line of study with the records of their investigations, fill volumes and libraries.

The city of Niles is situated in the beautiful valley of the St. Joseph river which runs through and divides it into East and West Niles, the eastern portion containing much the larger population and all of the business houses. From the river the banks rise in bold bluffs, the ground receding with an easy grade until it reaches, at a distance of about a mile from the river, an elevation of some 75 feet on the east side and 100 or more feet on the west. The eastern slope within the city limits may be divided into three irregular terraces, or nearly level areas, of greater or less width, underlying each of which is a stratum of impervious clay, terminating abruptly where the ground descends, and like projecting shelves, each catches the drip from the one above.

Into the drift of porous sand and overlying the clay, the wells are sunk, from which the larger portion of our citizens obtain their water supply. Water is reached at a depth of from eight to fifteen feet on the upper level, on the second level at from 30 to 40 feet, and on the lower portion at from 15 to 20 feet on the level with the river. That the water obtained from the shallow wells in the higher portion of the city is surface water, there can be no question, its purity depends of course upon the character of the soil through which it percolates, and to the amount of filth distributed over the ground surface upon which the rains fall. The water from the deepest wells, on the second area, is much better and purer, where it can be obtained free from the contaminating seapage from privy vaults, cess-pools and stables, which under existing conditions would appear to be impossible, except in the few instances where the "drive wells" have pierced through underlying clay. Of the wells on the lowest level, which is the oldest and most densely populated part of the city, with the soil saturated with the accumulated filth of years, and receiving the drip from the ledges above, it is a cause for wonder that all of those who use the water from them have not died, and that they have not would appear to be sufficient cause for want of faith in the theory of "danger from polluted water." Some years since a party in this district complained to me that his well was contaminated by a stable three squares distant.

About 250 families obtain their water-supply from Barron lake, the water from which is conducted by gravitation through pipes some four and a half miles into the city. The lake is nearly a mile in length, half a mile in width, and in certain portions it is very deep.

It is remarkable in respect to its having no visible inlet or outlet, it receives its supply from springs at the bottom. The beach of the lake is in nearly its whole extent a clean washed sand or shingle. The water shed immediately tributary to the lake is quite circumscribed in area, the land surrounding it being either in cultivated fields or covered by the original forest.

There are but few habitations near the lake, and I think but three within a distance of 30 rods of it, therefore it will be seen that the danger of pollution from the proximity of dwellings is reduced to a minimum. The

A short pipe extends into the lake some 300 feet; passing through a screen the water is conducted through glazed tile, cast iron, and cement-lined pipe, and distributed through the city in pipe of the same character, except in the west side where the Wykoff pipe is used. The water from the lake is soft, sufficiently so for all laundry purposes. Its temperature in very warm weather is too high to be pleasant without ice, but in the cooler seasons delightfully refreshing. It is a matter of regret, that no thorough analysis of the lake water or of the wells in common use has been made.

A few years ago at my request the principal of our high school, assisted by his class in chemistry, conducted a series of tests to determine the relative quality of water in different portions of the city. Samples of water were taken from twelve wells in use, representing the several sections of the city. The tests were made for nitrates, nitrites and ammonia. The results, as he informed me, proved that the lake water was by far the purest water, and the only sample in which no trace of ammonia was found. There is one fact to which I would call the attention of our citizens, and if I am mistaken I call upon the physicians present to correct me, and that is that for a period of ten years not a death from typhoid fever has occurred in any family who has used exclusively the lake water. When the sun's rays become sufficiently powerful to elevate the temperature to the point which is necessary to revive the dormant energies of aquatic plants which is usually about the middle of May or early in June, the new growth appears to push off and start in motion that of the previous year. When this occurs then the inhabitants of the "mighty deep" make their appearance much to the annoyance and terror of those who notice them. For the edification and comfort of those who use Barron lake water, I am happy to state that the water fleas, gonium or algae, cyclops and other forms of animal and vegetable life found in it appear as harmless when compared with those found in Croton water, some of which assume the size almost of lizards or at least are more disgusting in appearance. And yet, Dr. Vaughan informed you last night, that the death-rate from typhoid fever in New York, where the water from the Croton river is used, is only 2 per cent per 10,000.

I have a plate of these various forms of animal life prepared by Mr. John Michaels, (microscopist) for the Sanitary Era, with a descriptive catalogue which those who wish to examine them can see.

With the imperfect description given an idea may be formed of our present water-supply. As to the future, we may well ask "who knows?"

Since no botanist has, as yet, recognized the plant with which Moses sweetened the waters at Marah, and as no one has yet revealed the hidden "fountain of eternal youth" for which Ponce d'Leon so long searched in vain, we must reform our methods or suffer the consequences. I will close with a quotation from Dr. E. S. Richardson's paper, read at Reed City, before the Sanitary Convention: "Subjects of this character cannot receive due attention by those whose time is occupied in vocations foreign to such study. Hence the necessity of delegating suitable persons to guard the health of the commonwealth, who with crucible and re-agents, with microscope and instruments of precision, will detect the first germ before it has started on its deadly mission. That such may be done there is hardly a doubt; that it will be done depends on you whose will is law."

DISCUSSION OF "THE WATER-SUPPLY OF NILES."

BY PROF. DELOS FALL, M. S., MEMBER OF THE STATE BOARD OF HEALTH, ALBION, MICHIGAN.

[Reporter's Abstract.]

MR. PRESIDENT, LADIES AND GENTLEMEN—I believe that a Sanitary Convention should adjourn at a healthful hour, and, therefore, I shall not take up very much of your time.

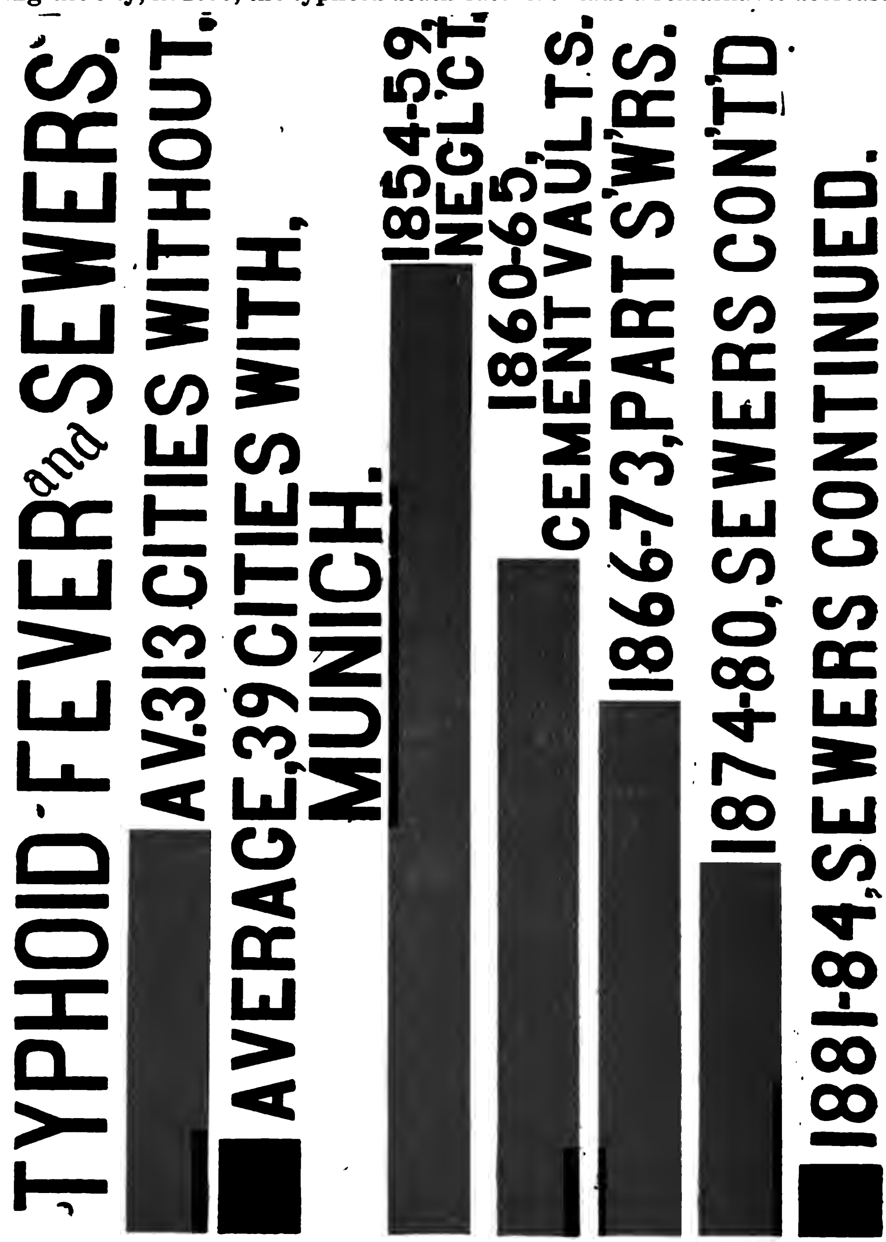
Consider the way in which the water comes to us. It comes from heaven, and falls upon the earth. Water is the great solvent. It falls through the air, reaches the house-tops, the earth, and the wells, bearing with it many impurities which it has come in contact with in different places. I suppose that during the thirty-five or forty years, since the organization of this city, many of the house lots have had several privy-vaults, cess-pools, and other holes dug for the reception of sewage and other decayed matter. These vaults and cess-pools have been used for years and, when full, are covered over with a thin layer of earth. The filling up of privy-vaults with the fecal discharges, the removal of privies from one part of the house lot to another, and the scanty covering of earth over these privy-vaults, cess-pools, etc., all tend to contaminate the water-supply.

The well is the common receptacle for the water which falls as rain, and which filters through this mass of impurities and poisons. The well water in the city of Niles is undoubtedly contaminated. Why are not all the people of Niles sick? This is the question asked by many, and some are unable to see why, if the wells are contaminated, the people are not all sick. Some will say that they have used this water for years and are yet in the full enjoyment of health and life. But, sometime, when the people least expect, the typhoid fever germ will get into the water of some well in Niles, and there will be an outbreak of typhoid fever, and a number of citizens will die from that disease. Then the people of Niles will be able to see the necessity for a pure water-supply and a complete system of sewerage.

Here is a diagram, accurately drawn to scale, "Typhoid Fever and Sewers." *In the lower half of the diagram, relative to Munich, Germany, the long black line shows the average annual death-rate from typhoid fever, for the six years, 1854–9, when Munich was absolutely without sewers or any way to dispose of its waste and excreta, and its water-supply was from wells—the death-rate from typhoid fever was at its maximum, 24.2 per 10,000 inhabitants. The second line, which is some shorter, represents the death-rate (16.80), when the inhabitants were required to cement their privy-vaults, and occasionally clean them out; and, with this slight change for the better, an annual saving of seven human lives per 10,000 inhabitants from death, from typhoid fever. The third line represents the death-rate (13.30), when a portion of the city of Munich had adopted and were using a system of sewers; and you will see a great reduction in the number of deaths from typhoid fever. The fourth line shows a corresponding decrease in the death-rate (9.26), when sewers

* This diagram "Typhoid Fever and Sewers" is printed on page 52.

were being constructed. The fifth and last line shows the remarkable change in the death-rate (1.40) per 10,000 when the city was almost entirely under a system of sewerage, and had a good water-supply. Today in the city of Munich, not 24, but a little more than one person to each ten thousand inhabitants die every year from typhoid fever, which is seventeen times less than it was before the systems of sewerage and water-supply were introduced. Though Munich has been growing, and becoming more densely inhabited during all these years, since the first move toward sewering the city, in 1859, the typhoid death-rate has made a remarkable decrease.



Unless some change is made in this city, it will happen that the dejection of some typhoid fever patient will be thrown into a privy, without being disinfected, the specific germ will work its way into the water-supply of several families, and an epidemic of typhoid fever will result. I will cite you two noted outbreaks of typhoid fever—where there was great mortality—where it had been thought the water-supply was proof against pollution with the typhoid fever poison:—

At Lausanne, Switzerland, about 1876, an outbreak of typhoid fever occurred in which not less than 130 were attacked with the disease, out of a population of about 8,000. The source of the poison was traced to an isolated farm house on the opposite side of the mountain ridge where three cases of typhoid fever occurred just prior to this epidemic. A small stream of water in which the clothes of the patients were washed and the fecal discharges were thrown, ran past the house. On thorough investigation it was found that the water of this stream filtered through the mountain ridge and re-appeared, on the other side of the mountain, as a mountain spring from which most of the inhabitants of Lausanne obtained their water-supply.

At Plymouth, Pennsylvania, a small village on the Susquehanna river, in 1885, an outbreak of typhoid fever occurred in which there were 1,000 cases and 110 deaths. The water-supply was taken from several different sources. A laborious and careful investigation was made by the Pennsylvania state board of health, proving conclusively that the whole number of cases sprang from a single case, a man living on the banks of the mountain stream from which the city obtained part of its water-supply. The dejections of that first case were cast on the ground near this stream. The typhoid fever poison found its way into this stream, and consequently into the reservoirs of the public water-supply, and the typhoid fever broke out among the water consumers. The total cost of the epidemic, in the town, a little larger than Niles was estimated at $97,120.

Two things should be done by the intelligent people of Niles: (1) make sure that the water-supply is free from contamination; and (2) make a careful disposition of your waste and excreta, so that there is no chance for the contamination of the water-supply.

The council of the city of Niles should prohibit the further use of privy vaults, should consider the question, from a financial standpoint, of putting in a complete system of sewers, and thus save themselves the money losses, from death, and dangerous communicable diseases which may afflict the citizens in the future.

CAN CONSUMPTION BE PREVENTED?

BY SIMEON BELKNAP, M. D., NILES.

The subject which has been assigned to me, namely, "The Restriction and Prevention of Consumption," is one which should interest the public generally more than any other which physicians are called upon to deal with, for several reasons, foremost among which may be mentioned its wide prevalence, its appalling fatality, its undoubted contagiousness. The rapid advances in knowledge concerning it and the inclination among a large portion of the people to look upon it not only as incurable but unpre-

ventable. Although the disease has existed and been recognized as an alarmingly fatal one from the earliest times, and has prevailed to a greater or less extent throughout the known world, yet there has been, perhaps, as little progress made either in its prevention, restriction or treatment as any other disease. At the present time it is estimated to be the cause of one-seventh of the deaths that occur. In the State of Michigan not all deaths are reported: but, in the year 1889, 2,137 deaths from consumption were *reported*, which was nearly three times as many as from diphtheria, and about nine times as many as from scarlet fever; and, in our own beautiful and healthful city of Niles, out of a mortality of eighty-five during the year 1890, there were nineteen victims of this dread disease; and these, as a rule, were people in the prime of life, and among our most useful citizens.

In the face of such figures it needs no apology from one who would ask the people of this city to pause for a moment in the routine of their daily lives, and consider with us the best methods, which we at present have at command, to abate such an appalling mortality. While it has been known, for a considerable length of time, that in certain sections of the country it was less prevalent and less fatal than in some other sections, and that, when it once entered a household, there was great danger of its spreading to other members of the family, and by a greater portion of the medical profession has been considered hereditary, yet not till within the past few years has it been proven conclusively to be contagious, which may, in part, account for the lack of progress made in preventing its spread. The advances in knowledge concerning this disease, considering the difficulties to be overcome in making these advances, are the wonder of the medical world, and will, I trust, be apparent to you before we are through with this paper and discussion.

It is the common impression among non-medical people, that consumption is never cured or recovered from; yet it is a fact, which was known to eminent pathologists of past generations and has more recently been demonstrated in our large hospitals of New York, Philadelphia and other large cities, that quite often there are found in the lungs of persons dead from other than tubercular diseases, scars or cicatrices of greater or less extent, calcarious concretions and circumscribed dead masses, indicative of a former destructive process, which from some reason or other had not progressed to a fatal termination but had by some fortunate intercession or unknown remedy been arrested in its progress. These scars were undoubtedly the remnants of old tubercular inflictions.

It is then a curable disease, or in other words a great number of cases have recovered without any known specific. It is estimated that about 60 per cent of all the post-mortem examinations in the charity hospitals of New York city, show that at some time in the course of the person's life, they had been affected with the disease and had been cured, or had recovered without medical aid.

Whether consumption is hereditary or not, is a disputed point; that a child may, and quite frequently does, inherit a depraved constitution, deformed or contracted chest, or so to speak, inherits the soil adapted to, or capable of growing the seeds or germs, there can be no reasonable doubt, and it is necessary for a person possessing these peculiarities or impaired health from any cause, to exercise great care about exposing himself to the contagion, as the system is illy prepared to cast off the germ when once planted in the lungs. If you ask, "in what does the contagiousness consist," I answer, in a so-called germ or seed; and without this germ,

consumption does not exist. As you cannot raise cotton, wheat or corn, without you plant the seed, on soil favorable to its culture, neither can you produce a case of consumption unless you sow the seed which produces it; consequently what one consumptive has sown is reaped by another, and if we could today rid the world of its seeds, we could as certainly rid it of tubercular consumption. In the scientific investigations which have been going on for the past few years (and which have resulted in establishing beyond a reasonable doubt, the cause of the contagiousness of this disease), the workings of the human mind, its tenacity of purpose and the vast scope of its reasoning powers have been most vividly illustrated. To Dr. Robert Koch, the man who is now the central figure of our profession, under the directions and pay of the German Government, is due the credit of finding this germ and proving that it and it alone produced the disease. He first discovered a bacillus in the sputa of patients suffering from the disease, which seemed different from that found anywhere else. So small was this germ that it required the most delicate manipulations for its discovery, and it could only be seen with the highest power of lens under condensed light, it being about 1-10,000 of an inch long, and one-sixth to one-eighth as broad as it is long. Yet the proving of the existence or presence of this germ, was a small part of the undertaking. He must prove that this germ and this alone was the cause of the disease. This he did, by most lengthy and painstaking investigations. He first separated the germ from all others, which required almost limitless experimentations, then injected a solution containing the organism into a pefectly healthy animal. From this animal he took the germ and injected it into a second, and so on, until seven healthy animals had been inoculated, each from the one preceding, and all of them having and dying from the same disease, consumption. Experiments of this kind proved to the world that the so-called bacillus of Dr. Koch was the cause of consumption.

In these discoveries and studies of course Dr. Koch was met by most violent opposition. His way to the summit was not an easy one, but one by one these have yielded to the superior genius of the man of intellect till today he stands practically without opposition from any prominent physician here or elsewhere, and acting upon this as a basis, many other investigations have shown its method of transmission. These experiments seem to demonstrate that the germ is not transmitted by the breath of the patient, but rather thrown off in the sputa, which, when dry, becomes a part of the dust and is inhaled into the lungs of both the patient and others, thereby hastening the fatal termination of his own disease and implanting the seeds in the lungs of his friends. When it finds the soil favorable, it is certain to take root. By this you will see that it is not always necessary to seek the presence of the consumptive, to contract the disease.

Wherever the patient goes he may scatter the germs which will bring death to some happy home. Thus it is, that consumption becomes a contagious disease and in order to prevent or restrict it, we must destroy the germs. How this can be accomplished, is a problem for the State Board of Health, aided by necessary laws and regulations and the cheerful coöperation of all good, law-abiding citizens, acting with the medical fraternity.

It has been suggested by some, that every person suffering from the disease should carry with him a cloth or piece of oiled paper upon which

he should deposit the sputa and either burn or bury it, and when in his room should use a cuspidor containing some disinfecting fluid, capable of destroying the life of the germs; but whenever a patient is afflicted with a cough and expectoration, he should consult some reputable physician and have his lungs examined, and the sputa placed under a microscope, to determine if the germs are present and then govern himself accordingly.

Other and very important factors in the contraction of disease are whatever tends to impair the vital powers, interferes with the mechanism of respiration, impure or unwholesome food, exposure to cold, lack of proper clothing, especially for the chest and feet, living near low or marshy ground, sluggish streams or waterfalls; in short, impaired health from any cause, as the disease is cowardly in its acts, attacking most often those who are weak.

In view of all these facts, it is scarcely necessary for me to say that a large percentage of cases of consumption could be prevented by the patient and friends exercising proper care and watchfulness, as it has been proven that no person contracts the disease without exposure to the germs, and that those most likely to have it by exposure, are those whose health is impaired from some other cause, rendering the lungs susceptible to it, as the seed does not grow unless the soil is fertile, which should admonish us so to live as to keep the bodily health above the possibility of such contagion.

When there is any herditary tendency to disease existing in a child he should be watched with the greatest of care; selecting favorable location for a home, observing proper habits of diet and exercise, protecting the body with good warm clothing, having properly ventilated sleeping apartments, with plenty of out-door exercise, or manual labor, and systematic and properly regulated gymnastic exercises, calculated to expand or correct any lack of development of chest. In these precautions you will find the State Board of Health ever ready to aid you. And in closing, permit me to say that the State of Michigan has a board second to no State in the Union, one of which every citizen should be proud. In all of our sanitary conventions, health journals and among medicial men, not only in this country but in foreign countries it is recognized as one of the most efficient, and its officers and members, have already acquired a world-wide reputation. It is estimated, from carefully prepared statistics, that through its efforts it has saved over 3,000 lives within the past year, to say nothing of the suffering and the vast expenses of sickness which have been saved. And yet we are told by some good meaning people, who have paid but little, if any, attention to its efforts, that it is a useless expense. Even our present Governor has suggested that the Board be abolished, or taken out of the hands of efficient professional men and placed in the hands of the Secretary of State! As well might he place our magnificently conducted insane asylum under the control of the superintendent of the State Prison.

VENTILATION AND HEATING.

BY W. G. BLISH, NILES.

The first, the last and the continual demand of life is air, and no one disputes the fact that, for the best health and the power of resisting disease, the air must be pure. It is estimated that fifty per cent of all fatal diseases are the result, directly or indirectly, of breathing impure air. Yet, important as it is, there is perhaps no subject of any human interest to which less attention is paid in a practical way than to our air supply.

At every instant of our lives, waste matters, matters that are dead and for further use are obnoxious to animal life, are presented at the lungs for removal. At each respiration of pure air oxygen is absorbed and these effete matters are taken up and thrown off with the air expired. Perspiration also adds to the sum of these noxious products in the air about us. The use of ventilation is to remove these and other deleterious matters from our presence and to keep us supplied with the oxygen necessary to their continued removal, and sufficient to make life possible and perfect.

The present condition of this room affords a striking lesson on the use and necessity of ventilation. Let us reflect on what the condition must be. As there is no provision for ventilating, the room must contain largely the same air that it did when we first came in. Here are nearly 400 of us who have been breathing this air over and over for two hours, just passing it back and forth from one to another, each one helping to deprive it of its oxygen, and returning in its stead the products of respiration and perspiration. There are also over sixty gas jets which have been consuming oxygen and generating carbonic acid equal to perhaps 200 persons more. In addition, the air is full of dust, raised by the commotion of so many coming in. Among the many things this dust contains are filth from the street, with any germs it may contain, and the sputa of consumption, sore throats, catarrh and other contagious diseases. Not directly detrimental, perhaps, but no more pleasing to contemplate, are the effluvia of decayed teeth, of catarrh, of perspiration, of gases from disordered stomachs, of the breath of tobacco chewers and smokers.

If for no other consideration, we should ventilate for decency's sake, for I do not overestimate the matter in the least when I say that it is quite as nasty to breathe these things, only that we do not see them, as it would be to drink the water of our bath. But what must be the result of breathing this air from a danger point of view? If the air taken into the lungs does not contain its normal amount of oxygen the waste products are not properly prepared for elimination, and even if prepared and presented at the lungs, if the air is already saturated with such impurities, which is true as far as respiration is concerned when it contains only a very small percentage of them, like a sponge that is full it can not take up more. The lungs also have no power of selection but must assimilate whatever is presented to them. The result is then that as we sit here our blood is not receiving its full quota of oxygen, the waste matters are imperfectly eliminated, and the same matters that have been once expelled, which are carbonic acid,

and organic matters largely in a state of decomposition, are inhaled to be in part reabsorbed. Hence our systems are rapidly becoming loaded with virulent poisons, poisons that depress the vital powers, undermine the health and lay the foundation for permanent ill health and disease.

The condition in this room is that in our churches and school rooms when occupied, and is only an exaggeration of the state of things in our homes. But in our homes we add to the danger by carefully closing every opening and by covering our walls, which are naturally porous, with paper and paste. The paper is often decked with poisonous colors and the paste decays and makes a habitat for disease germs. We also pollute the air within by poorly managed heating, by bad and dirty lamps, by decaying vegetables, by improperly cared for wastes of the kitchen, by foul basements, by leaks from gas fixtures and imperfect plumbing.

With the evils just named the ounce of prevention is worth the pound of cure, but as we cannot wholly prevent them the remedy is ventilation. We believe theoretically in ventilation, but in practice we build our houses as if fresh air next to cold is the greatest thing to be avoided. The only objection ever offered to ventilation is the cost; yet the amount of fuel required to warm the air we need, sufficiently, is really small and costs less than many things of much less importance which we do not do without. We economize in matters of true health and comfort and waste where there are no returns. We build our houses air-tight and scrimp in buying apparatus for warming, and then waste enough by poorly devised apparatus and bad firing to have given us good ventilation. We defy nature by living in a vitiated atmosphere, and pay more than we have saved to the doctor and the druggist, vainly endeavoring to be made whole.

I would not convey the idea that ventilation is a simple problem that everybody can solve without some study or forethought. It is influenced by so many things as the arrangement of rooms and openings, conditions of wind, weather, etc., that no system can be made automatic, or that does not require attention. It should be a part of the study of every architect, and to obtain the best results must be provided for in his work. The question for the masses is how to save expense and how to avoid as much as possible the need for care which is sure to lead to neglect. In moderate weather we can use the doors and windows but in cold weather we have to avoid cold and dangerous drafts.

The ordinary grate is perhaps the most popular method of ventilating. With a proper provision for the supply of pure air it is certainly very efficient. The air of a room also does not become over heated as is liable with other methods of warming, and being cool it contains more oxygen to the cubic foot, hence is more invigorating and pleasant to breathe. The grate has its drawbacks though. As usually arranged it subjects us to cold currents which flow along from the cold windows and doors, strike us in the back and play around our feet. It is also extremely wasteful of fuel, dirty, requires frequent attention, heats the room unequally and is quite liable, particularly when only a slow fire is required, to leave smoke and gases in the room.

The hot-air furnace affords good ventilation when properly manged. I need not say anything further of its advantages which are well known, but will only speak of its drawbacks which, generally, are not so well considered. In the usual construction the heating surface is too small for economy and is liable to become overheated and the circulation is cramped.

by small flues, still further reducing the economy and largely spoiling the air for breathing. Hot-air furnaces are rather uneconomical at best, because air is slow to take up heat or to give it out. Warming a room by the heating of the air is all wrong, too, in principle. The main use of the air is for breathing and it is not desirable to habitually breathe air much above a moderate temperature. Warm, rarefied air is very debilitating, causes headaches and makes us feel bad and uncomfortable every way. Dr. Wm. A. Hammond says it makes us cross, disagreeable and even vicious. Passing over highly heated surfaces air also becomes over-dried, parched as it were, making it harsh to the mucous surfaces of the throat and nostrils. Supplying moisture improves it, but this is nearly always neglected. The danger of bronchial and pulmonary troubles is also increased by going suddenly and often from a room into which the air is flowing at a temperature of 100 degrees and upward, out into an atmosphere of freezing or zero weather. Such sudden and severe changes can not be safely made with impunity by everybody.

It is very important to have the air cool for breathing. You all agree with me that the cool air of winter braces and invigorates while the warm air of summer depresses and enervates. Carbonic acid is eliminated more freely in a cool than in a warm atmosphere, the brain is clearer and the secretory organs are rendered more active. Many cannot understand how we can have cool air in a warm room or keep warm in a room that contains cool air; but you can all understand that air is warmed slowly and only as each particle of it comes in actual contact with warm bodies. Hence with a continual admission of cool air the air of a room can easily be kept at a lower temperature than the room itself. Cold air also offers no obstruction to the passage of heat; so that a hot stove, or any warm body sends out its heat to us with the same facility through a body of cool air as through warm air and without even warming the air. In fact this is the way we get most of our warmth from the outside, by the radiation of the objects about us. Some will object that passing cool air through a room must carry off a large amount of heat; but it requires a certain amount of air to ventilate in any case, and there should be an actual saving if the air is disposed of, or leaves the room, at a low temperature. The cost for fuel is owing not so much to the air we use as to the radiation to and taken up by the cold windows and walls of the room.

The true way then to warm our rooms is by direct radiation, warming the air as it enters just sufficiently to take off the chill and prevent cold drafts. If you will use the hot-air system always select a heater larger than the maker says you need. Then put in large supply pipes and not try to warm large rooms with small pipes as is often done. Small flues obstruct the circulation and hold the heat back at the furnace, while large quantities of air moderately warmed is more economical and is more pleasant than a small amount highly heated. Don't attempt to use the plan adopted by a few makers who wish to save your fuel and hence your good will at the expense of your health: that is to return the air from the room to the heater to be used over and over. It is well enough to do this in warming up an empty room, as a church or a hall, before assembling, but before the audience arrives, fresh out-door air should be turned on, for the room will be foul enough at best in a short time. In rooms with few occupants it might do to return a portion of the air if it were practical to do so, but it would introduce a complication and confliction of currents that would be troublesome to manage. The only safe way is to use nothing

but the pure air from the outside, even carefully excluding all air of basements. The cold air pipe should be of larger capacity than all the warm air pipes combined so that they will all be fully supplied. If they are not some pipes will rob others, counter-currents will take place and the effort of the pipes to fill will suck the smoke, dust and gases from the joints of the heater and convey them to your rooms.

The smoke flue and chimney should also be large and not obstructed with dampers in such a way that the products of combustion will be forced into your rooms instead of going up the chimney. Small chimneys are also more easily overheated and so become cracked, and then, if forced beyond their capacity, are very prolific of fires. Thousands have learned this, from bitter experience, yet, inconsistent as it seems, they continue to build chimneys the same way. The fire should also be regulated as much as possible with the front drafts instead of by dampers in the pipe. Such dampers are sure to be misused. It is said of them that they save heat. But we put in a fire place with a large, open chimney that carries the greater part of the heat out and think nothing of the loss, while with a stove or furnace we go to the other extreme and blacken our walls and pollute the air we breathe. We can sometimes see the results of such practice as it often happens that people are smothered by coal gas leaking from their stove. This is a good place to speak also of the pernicious practice of using gasoline and gas stoves in closed rooms. A case was recently reported where husband and wife were both asphyxiated by a gasoline stove. The oxygen is rapidly consumed, carbonic acid is generated in large quantities and carbonic oxide is sometimes formed in small quantities. It is said of the latter that one breath of the pure gas will knock one down as quickly and as surely as a club.

The great majority of people depend on stoves for warming, and for economy and simplicity of management it is one of the most desirable methods of heating. But with the stove alone and no provision made for ventilation, if carpenters succeeded in making our rooms air-tight, as they attempt to do and as we try to have them do, we could smother to our heart's content. The best method of introducing fresh air in stove-heated rooms is perhaps to run a pipe from out of doors to underneath the stove and with a sheet iron or metal casing compel the air to flow against the stove as it enters. Or a flue could be run up in the partition back of the stove, opening out at the top of the room. This would let in the cold air where the current rising from the stove would help to spread and diffuse it about our head. Another plan is to lower an upper sash a trifle and adjust a thin board in such a way as to deflect the current upward so that it will not drop directly down upon us. Whatever method is used the upper portion of the room should not be a great deal hotter than the lower portion. It is no uncommon thing to find a difference of twenty or more degrees, more often in rooms warmed by hot air. The heated air rises at once to the top and a lake of cold air is found at the bottom, reversing the injunction to "keep the head cool and the feet warm." An aid to equable warming is to place the heater on the cold side of the room. With a stove or grate so placed we need not always when sitting by it in cold weather burn our face and at the same time freeze our back.

The question of getting the foul air out of a room is as important as getting the fresh air in, for air wont flow into a room that has no outlet to let the existing air out. Hot-air heating has sometimes failed on this account. The cold air not being drawn off at the bottom, the warm air that does

enter rises to the ceiling, there struggles to escape and does escape from every crack and pore, leaving the cold air stagnant near the floor. The location of ventilating flues is a matter for consideration. It is better not to compel the cold air falling down the windows and the cold walls to flow clear across the floor and over our feet before it can escape. We should also study, particularly in large rooms, to have all parts of the room benefited. For instance, if we were to place a hot-air register at one end of such a room and the foul air openings at the opposite end the air in being cooled by contact with the walls might, as it falls down there, be drawn off without properly changing the air in the center of the room. In such a case both inlets and outlets must be so distributed that the ventilation will be equalized. It must also be borne in mind that flues in external walls, which are open near the floor, without the application of artificial heat, or unless thoroughly protected from outside cold, will generally fail to work. The cold from the outside is quite sure to prevent and even to reverse the draft. There is also some risk in ventilating several rooms directly into one flue. If the flue is not ample and properly warmed some of the rooms will, at times, draw a part of their supply from the flue instead of discharging into it.

I doubt the advisability of turning the foul air into the smoke flue as is often recommended, for there are a great many days in the year when it would seriously interfere with the draft and likely cause the apparatus to smoke, or leak gases. Many of you have probably had some experience with trying to run a fire with an open stove-pipe hole in the chimney; it always ruins the draft. The check-dampers used by stove makers demonstrate how a very small inlet of cold air in a stove pipe effectually cuts off the draft. Besides, chimneys are almost never made large enough to answer for both smoke and ventilation. An ordinance recently adopted in Worcester, Mass., makes it obligatory in that city to vent water closets into a heated flue or into the kitchen chimney. The latter method should be condemned and never permitted under any circumstances. The plan of making the ventilating flue large enough to permit the smoke flue to run up inside of it is a good one; also the applying of artificial heat as a gas jet or steam-pipes, etc., is not only good, in some cases it is actually necessary to create a proper current. I might add here that an opening over a kitchen stove to take out the steam and smell of cooking is a good thing. It should be 18 inches or two feet square to give good results. The draft of such an opening instead of allowing the smells to permeate the rest of the house will tend to draw air from the surrounding rooms.

It is too often not taken sufficiently into account that it requires a definite rise of temperature in a flue to create a draft. It is quite commonly supposed that a flue or a chimney always draws of itself, that it is the nature of the thing to draw. This is true only where the air within the flue is warmer than the air without. Even warm air does not rise unless it is warmer than the air that surrounds it. In the summer the flues are much of the time cooler than the warmer air outside, hence the draft is downward instead of upward. All are familiar with the experience of trying to start a fire when the smoke instead of going at once up the chimney persists in pouring out into the room; or you may have started up only a little fire for a short time in the morning, and for the rest of the day smelled the odor of some partially burned substance in the stove. The air in a flue one foot square and ten feet high weighs, at ordinary room temperatures, about three-quarters of a pound. A rise of ten

8

degrees will make this air lighter by only about one-quarter of an ounce. This one-quarter of an ounce then is the measure of the draft in that flue for that relative temperature, and is the power that would have to keep that three-quarters of a pound of air in motion against the friction of the sides, and of the bends if there were any, of ten feet of flue. In moderate weather, as in many days we have in the spring and fall, the temperature within and without is so nearly alike that ventilation is quite uncertain and frequently fails altogether without the special application of heat. It should not be overlooked in considering the Ruttan system, which has been recommended here for school houses, that it requires a large amount of extra heat to draw the air from the top of a building to the basement and make it traverse the long, tortuous passages through which it has to pass. The warm air of the rooms resists being drawn downward, hence with a little neglect the ventilation is apt to reverse and carry the odor of the fecal matter in the drying rooms to the study rooms. In practice this difficulty is found to exist.

It is very important that flues should be sufficiently large. It is impossible to give any definite rule because conditions vary so, but the average of authorities would give for a continuously occupied room about a square foot of opening for each six or eight persons, and the same for every two or three gas lights. For temporary occupancy as a hall or church the lowest allowance should be about one square foot for each fifteen persons. Calculated by this rule we have not a decently ventilated hall, church or school building in the city. Just note the condition in this hall. In fact there is no provision for ventilation whatever; for what little was made by the architect has been closed. This hall filled and all the gas jets burning should have an aggregate of not less than fifty square feet of openings, or the equivalent of a flue five by ten feet for the admission of pure air and a like amount for the escape of foul air. The air in a flue of even that size, to do its work properly, would have to travel with a velocity of four or five feet per second. To create this velocity by natural ventilation would require that the flue for the outgoing air be smooth, without bends, and 25 feet high, and the temperature inside exceed the outdoor temperature by ten degrees. It must be taken into account also that a motion of four or five feet per second of air within a room amounts to a strong draft which for the incoming air would have to be modified in some way before it should be allowed to reach us.

It has been a much discussed question whether we should ventilate from the top or the bottom of a room. Expired air at the same temperature is slightly heavier than pure air, but when first expired owing to the heat it receives from the air passages, it tends to rise. This needs hardly to be taken into account, however, for by the law of diffusion of gases it is soon found, where the air of the room is unchanged, that the foul air is pretty equally distributed. Hence the best way to dispose of the foul air is to locate the openings so as to draw off the air that has been longest in the room, which would naturally be the most impure. If the entering air is the warmest it rises at once to the top of the room. In that case we would expect to find the air most impure at the bottom. If we were supplying our rooms with air cooler than the objects in the rooms we should find our foulest air at the top. In short, if the pure air is warmer than the room ventilate from the bottom, if cooler, make the openings for the foul air at the top. It is also better to let fresh air in, if warm, at the bottom, and if cool, at the top. The ideal method of warming and ventil-

ating our rooms would be to heat the floor and the walls for a short distance above the floors, and to introduce the fresh air, somewhat cooler than the room, through a number of small openings distributed overhead. The foul air openings in this method should be close to the floor, and with large rooms other openings should be made in the floor at different parts of the room and connected with the same outgoing flues. This would give us a cool head, cool air to breathe—air that would invigorate and refresh, and another grand thing would be accomplished that is realized in but few houses—our feet would always be warm.

A thing no less important than the ventilation of the rooms we occupy is the ventilation of basements. Most houses have also inclosed spaces under them with even the surface soil with its decomposing matter. These damp, unventilated spaces are extremely bad. The pressure of winds outside forces the gases naturally existent in the soil, and the musty air of these spaces, up through the cracks of the floor, and the house itself acts as a flue sucking them up to mingle with air we breathe. Spaces under floors should be ventilated, not with the little two by four hole sometimes made for that purpose, but by an ample opening. A great source of dampness in cellars and under floors in warm weather is the condensation of moisture from the air. These spaces, being cooler than the air without, condense more or less of the moisture of the air that gets access to them. A greater circulation of air would, in addition to ventilating, remedy the difficulty by warming the surfaces with which it comes in contact to so nearly its own temperature as to prevent the condensation taking place. Too little pains, too, is taken to make foundation walls and the cellar bottom itself water and air tight. Damp underneath means damp, musty floors and carpets. Nothing adds more to the health and comfort of a dwelling than dry, warm floors. Flooring should be narrow and well seasoned before putting down. Wide, unseasoned boards shrink, leaving great cracks to collect dirt. A very unclean thing to do is what nearly every housewife does do when she attempts to clean the floor; that is to flood the floor with water and mop the cracks full of the filth that should have been removed. The soaking also swells the boards so that when they dry again the cracks are ready to receive still more filth, making a source for evil smells and a hiding place for vermin and disease germs. Floors ought to be painted and made as nonabsorbent as possible. The saving in labor also to the housewife would well repay the expense.

I cannot forbear a word specially about sleeping rooms. They are often, in fact generally, too small, and nearly always closed up too tight. It should not be taken for granted because we do not smother in a night that therefore the room is well ventilated. We can smother gradually, just as surely as if it took place quickly. Eight to ten hours of every twenty-four, or more than one-third of our lives, are spent in these rooms in a recumbent posture, with the head buried in pillows and coverlets in such a way that the air cannot circulate freely about our nostrils. At best the circulation of the air of a sleeping room in the quiet of the night is not the same as in a living room in the day time where there is more or less moving about, opening of doors, etc. We can readily see then that there is special need for ventilating sleeping rooms. If you are not already using some efficient method, lower an upper sash a little, according to the weather, and don't shut up the opening with a close blind or a heavy curtain, especially when the temperature outside is so nearly like that inside that no change of air can take place. If your room smells close in the

morning, if your mouth tastes bad or you feel as though you were not refreshed, take the hint and try the open window a few nights, or long enough to get used to it, and you will be surprised at the result. Some people never bathe. Those who practice bathing feel so nasty without it that they cannot dispense with it. It is the same with the pure air habit; only those who have been used to having pure air can realize what it is to be deprived of it. Don't be afraid of taking cold because it is cold without, for bedclothes will keep you warm. There are more colds contracted from breathing foul, warm air than from breathing cold, pure air. Neither should you have any of that superstitious dread so often entertained of night air. If you breathe at all at night you must breathe night air, for there is no other. Don't be afraid of it because you imagine it is damp. Ordinary dampness doesn't hurt air for breathing. You never think of any harm from breathing the air of a long spell of rainy weather, or of an ocean voyage, yet air couldn't well be damper. It is true that damp clothes are not good, but ordinary night air will not even make your room damp, for being cooler than the objects within the room the tendency as it warms is to take up moisture instead of deposit it. Damp or dry, night or day, have air, fresh and lots of it.

DISPOSAL OF WASTE AND EXCRETA IN NILES.

BY J. D. GREENAMYER, M. D., NILES.

No question is, perhaps, so closely connected with the health of a municipality as the one we are to discuss for a few minutes in this paper. Waste and decay are, the result of life, and in the divine plan the individuals of one part of the animal kingdom become in a sense the scavengers for another, and thus a process of purification is instituted that otherwise would make this beautiful world of ours practically uninhabitable to human kind. Yet with this natural process or law to free us from many of the germs so fatal to human life we are daily brought into contact with circumstances and conditions that make its operation impossible, and human agencies and measures become necessary for the safety and protection of private as well as public health.

This brings us to the problem of how best to dispose of the waste and excreta which, if neglected, generate the most powerful disease-producing germs, capable of creating and perpetuating such alarming epidemics as to arouse the attention of a continent. From the very nature of things and the present state of sanitary science it is obvious that largely in its details every city or village must solve this problem for itself. So many dissimilar elements exist tending to make a system practical in one place and not in another, according to the state and combination in which we find them; for instance the drainage of a place, its elevation, character of its soil, slope of the land, population and its character, its water supply, compactnesss of its improvements, rainfall, etc.

In the examination of our own city let us observe—

1. What nature is doing for us in the removal of our waste.
2. Some suggestions concerning the removal of the waste and excreta in and around our homes.

We find our city almost equally divided by the St. Joseph river 300 feet

wide, with a fall of three or four feet to the mile, solid gravel bottom and clear water, both banks sloping abruptly toward it upon which the city is built, so that our natural drainage is into this river, and the natural adaptation to this end so marked that with every considerable amount of rainfall our streets, alleys and public places generally are well cleansed from the loose waste material so rapidly accumulating in level places, and by neglect and decomposition producing germs dangerous to health. Here I anticipate the objection some captious critics might interpose against polluting our streams with this waste. While as a rule to make a sewer or cesspool out of them might be in the highest degree objectionable, in our case we are exempt from at least many of the conditions that give force to these objections.

1. It is not the source of our water supply nor of any town between this and the point where it empties into the lake.

2. Our population is not so large as to block its course, or cause any considerable amount of accumulation of filth.

3. The fall, size and character of its bottom insures a rapid transit of foreign material.

Again, our atmosphere is almost constantly charged with a superabundance of ozone, which is an allotropic form of oxygen, and represents that element greatly intensified in activity. It is oxygen armed with a new energy and is capable of producing changes, which, in an ordinary state, are impossible, and while it is somewhat of an irritant to the air passages it is a powerful antiseptic and oxydizing agent, and in a remarkably short time will produce decomposition that otherwise might require weeks or months.

The late Dr. Reeves, while a resident here, made observations, covering a period of several years, and he informed me that the ozone in our atmosphere averaged from seven to eight per cent, while in almost every other portion of the State it was only five per cent, or less. As a result of this we have a remarkable immunity from severe epidemics of many of the germ and filth diseases, and a decided disposition toward catarrhal affections.

The second phase of my subject, namely: man's part in the cleansing process, is not so simple, nor a very savory one to discuss, and as we enter upon its consideration the Biblical injunction, "touch not the unclean thing" becomes intensely real. However, it has much to do with our home life and its surroundings, and it becomes our duty to point out some of the causes that sometimes make these homes houses of mourning on account of premature sickness and death. It is no uncommon thing in our city to find homes, some with elegant parlors beautifully furnished, but with the back dooryard full of "dead men's bones," namely: filth, scraps, garbage, and all sorts of waste material, thoughtlessly and carelessly cast off in this manner for want of a more convenient way of disposing of them, and little apprehending that they are like a dynamite bomb capable of bursting forth at any time with most serious and fatal results.

What, then, is the remedy, you will ask. This would be a much simpler matter than it really is. did people always take kindly to the prescriptions of an efficient health officer; in other words, co-operation between citizens and local boards of health; whereas, oftentimes there is a pronounced antagonism to any visitation of their premises for purposes of inspection, and the health officer is variously accused of being officious, meddlesome, or even abetting some objectionable neighbor's so-called persecution. If

public health is to be maintained at its maximum, sanitary laws must be obeyed, and this obedience can only be secured by a rigid system of inspection under the supervision of the city or its board of health.

Situated as we are on the banks of the St. Joseph river, it is apparent that the first and best remedy is a good system of water carriage, including water works and sewerage, owned and controlled by the city, and connected with the deep and main current of the river. This ought to be extended so as to include, First, every business house in the city; Second, the flat on the east bank of the river, and, Third, the central streets compactly built on small lots. Much has been said and written upon the effects and defects of the various sewerage systems in use, and practically it is safe to say that none are perfect, and it is hard to find a greater and more dangerous nuisance than a bad sewer, for as one has aptly said, "sewers are a good deal like much of the work of doctors and plumbers—under ground and hard to get at;" however, when well constructed they are not only an indispensable convenience, but a necessity in the removal of waste material. As there is to be a paper on this subject I hasten to make some suggestions applicable to parts of our city not reached by a sewer.

The refuse from the kitchen and table consists of bones, stale scraps of meat, vegetables, old bread, and garbage of various sorts. It is surprising how rapidly such material will accumulate if not disposed of, and where little or no attention is given to economy. A good way is to preserve most of it in a receptacle prepared for the purpose, occasionally throwing a handful of salt or copperas upon it, and then before it sours feed to some animals. Still another way is to burn it in the kitchen stove. In a small family this can be done by throwing it at once into the fire box, and if the quantity is large, as it is apt to be in large families or in boarding houses, it can first be dried in an apparatus made by placing two cylinders of sheet iron one inside the other, the inner one being shorter and two inches less in diameter than the outer one, the outer one open on the bottom and a movable cover on top, the inner one having a tilting bottom. The refuse is placed in the inner cylinder and the apparatus set over an open stove, and whatever germs or effluvia are emitted in the drying process escapes between the cylinders into the stove, and when refuse is dried out can easily be dumped into the fire and utilized as fuel.

For the liquid waste containing almost everything except fecal matter, the cesspool is still a common reliance. Nothing can be said in its favor; it is a huge reservoir of filth and putrescent material, and a magazine for the most dangerous germs and gases, affecting not only its owners but all of its surroundings by polluting the soil and, through it, the wells. It is far better to throw this liquid waste upon your lot in different places exposing it to the purifying and oxydizing influences of the soil, air, and sunshine, it will do less harm and serve as a fertilizer. Still another method of disposing of these liquid wastes is by the so-called process of irrigation, for which various appliances are in use, some of which are patented. The principle involved consists in filtering out most of the grease and sediment, and then by open jointed agricultural tiles and siphons diffusing it through the soil. This in many places is becoming a very popular appliance, and its use is constantly increasing.

Finally what can be done with the incorrigible privy vault? That it is a nuisance no one can deny, and the greatest wonder is that we do not hear of its evil effects more often than we do. It is possible perhaps in some cases, by frequent cleaning and thorough disinfection to make it

tolerable, but that it ought to be relegated to the crude devices of the past, admits of no question. Its best substitute is the dry-earth closet; it is perfectly practical, and much less expensive than the sewer system. In places like Birmingham, Dublin, Manchester and Glasgow, cities averaging from 200,000 to 600,000 in population, where it is being thoroughly tested, it is even superseding the sewer system, as being less liable to become foul, and the source of noxious gases that will and do escape from the best trapped sewers in the world. The main points in working a dry-earth closet are:—

(1.) To prevent the escape of the liquid;

(2.) Absorb, deodorize and disinfect the excreta; and

(3.) The frequent removal of the contents. The first is accomplished by a water-tight vault, made of cement, moveable pails, or galvanized basins; the second by regularly once a day throwing into them fine clayey earth, ashes or charcoal; and the third, is best done by the local board of health by appointing a paid scavenger for each ward, who will remove the contents once a week, disposing of it for agricultural purposes. By a little additional expense, and a more complicated structure, varied according to individual ideas, it can be safely introduced on any floor of a building.

I firmly believe this, or some modification of it, will be the privy-vault of the future. It may have to live down some of the prejudice and indifference of the present, but with a progressive and an aggressive sanitary science to make and to mould public sentiment, these hindrances will and must disappear, and we shall yet attain to that state of Godliness, nurtured and matured in the proper care and cleanliness of our bodies.

SEWERAGE AND HOUSE-DRAINAGE OF NILES.

BY DANIEL SHEEHAN, NILES.

The sewerage of any city or town is a matter of great importance. In fact, there is nothing, I consider, to be dreaded so much as its sewers, therefore it is the most important of all its improvements, and yet it is one of the improvements to which is given the least thought. A good and perfect system of sewerage is a blessing; a poor or bad system is a curse, and should not be tolerated for a day. Many people think but very little of the manner or way they will dispose of the filth that accumulates about their premises from time to time. Some use cesspools and some vaults, while others scatter it about the surface, feeling well satisfied in their minds that they have gotten rid of it very easily and with little trouble. What a mistaken idea.

In giving my views on this subject I wish to dwell on observations and experiences in the position I occupy to the public as a plumber, and as one who delights in the advancement that the profession is making for the safety and the preservation of the healthfulness of the homes of his patrons.

Many persons, and some, I am sorry to say, who are in positions to know better, think that any one can build a sewer. I will admit that they can, but are they competent? Is their knowledge of the laws of sanitation and drainage such as to make them qualified to perform such work? How many stop to ask themselves this question? I am sorry to say, judging from my position, there is only a small majority. The question in their minds is not the perfect way the work is done, but how cheaply,—saving, as they

suppose, by the operation. I am not now speaking of our people of Niles in particular, for the sewerage system is not yet very extensive, and yet, we have our share of this class, as do all cities. In many cases the pipes are put together improperly, without any regard to the inside. The joints are connected on top with plenty of cement, but the bottom is left without any. The liquids pass through these openings, and permeate the soil with their deadly gases. The occupant or owner does not think of the danger he and his family are in, and only makes the discovery when he and his household are stricken with disease, and sometimes death, as the result of his inexperience, or perhaps the unscrupulous dishonesty of the workman. How long this class will continue to impose on the public I am unable to say, but sooner or later the State will have to enact laws making it a criminal offense, and punish the offenders by either a fine or imprisonment. In fact, some cities have such laws now in force, and quite often we hear of some violator who is taken before the tribunal of law, and punished as he richly deserves.

In many cities the plumber does all the sewerage and drainage, while in others they have regularly licensed sewer builders whom the authorities hold responsible for the acts of their workmen; and even then the work is inspected by an officer of the health department before it is covered. In cities that have no board who acts in that capacity, the work is done, as I said before, by plumbers. Now, if the plumber does his work honestly and faithfully, he can make your home a haven of health and happiness; while, on the other hand, it will be one of misery and desolation. How many men who build a fine residence give this subject a single thought? Very few, indeed, and when their attention is called to this fact it is met with laughter and derision. Many homes are fixed up with costly and grand fixtures, which the owner delights in showing to his many friends, but he cannot show them the sewer, perhaps built in an imperfect way, and day after day dealing out its mischief in a sure way. Sickness and disease take a firm hold in the family; a doctor is called, and even then, with all his skill, he is unable to stay its fearful ravages.

Now, here I claim that the person who can and does prevent the causes of sickness is a greater benefactor than the man who cures them. Now, here is where the plumber plays an important part in the affairs of the home, office and store, and yet very many people think a doctor is cheaper than a plumber; in fact some doctors are of the same opinion.

The sewerage system of Niles is not very extensive at present, and what sewers are here belong to private parties. The one known as the Sheehan sewer, on Main and adjacent streets, was built in 1885, by permission of the city council. There is at present about 4,600 feet of pipe sewer ranging in size from eight to twenty inches in diameter, laid at a depth of from seven and one-half to thirteen feet, and giving sewerage to 43 buildings on its line, namely: The central school building, two hotels, 29 store buildings and 12 residences, disposing of the excretions of more than 700 persons daily. There is along the line of this sewer or in close proximity, 110 more buildings, both public and private, they can easily be attached whenever the owners see fit to do so. It is with many regrets that I am compelled to say that the people of this beautiful city are adverse to using the sewers and thus they lose the benefits they would derive from them.

I now propose to give you the correct and precise manner in which I lay the pipe from the main sewer to the premises to be sewered. The pipe is laid to an even grade, giving it all the fall that the depth of the main sewer

will allow, the main being from 7 feet 6 inches deep to 13 feet. I have done away with what is known as the main trap in the drain, carrying the soil pipe up through and above the roof, thereby giving ventilation to all parts of the sewer, allowing the deadly gases that accumulate to pass off, and so releasing the pressure on the main sewer and preventing explosions which often occur, endangering the lives and property of our citizens. Here I wish to call the attention of this convention to the abandonment of this trap, as I feel from the experience I have had here that I am on the right road. Some years ago I stated in one of the leading sanitary journals what I had done. Considerable discussion followed and good authorities are not fully agreed on that point. I believe, however, that there are good reasons why this trap should be dispensed with.

As to the future of the sewerage of our city, I am not prepared to say, but I will venture an opinion that there will have to be a radical change in the minds and actions of its people before it is further extended. The greatest obstacle in the way of its further extension, is the great army of fault finders and knowing ones, and I can assure you that our fair city is not behind its sister cities in having its competent members of this class, who are ever ready and willing to condemn the sewerage, because the beauty of their streets are marred by the march of improvement brought about by the putting in of a sewer, which cannot be done without tearing up the streets, to which they are all so much opposed; but they find no fault with the many little mounds raised year after year in the cemetery, for the want of the proper knowledge as to the laws of sanitation which must come sooner or later to the relief of our beautiful city.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

NEGAUNEE, MICHIGAN,

AUGUST 13 AND 14, 1891.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF NEGAUNEE.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1892.]

[NO. 357.]

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1891.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

NEGAUNEE, AUGUST 13 AND 14, 1891.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH,
FOR THE YEAR 1892.

[No. 357.]

Robert Smith & Co., State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

NEGAUNEE SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT NEGAUNEE, MICH.

AUGUST 13 AND 14, 1891.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1892.

MEMORIAL FROM CITIZENS OF NEGAUNEE, FOR A SANITARY CONVENTION AT NEGAUNEE.

We, the undersigned citizens of Negaunee, Marquette county, Michigan, in view of the fact that we now have an epidemic of scarlet fever and typhoid fever in our midst and remembering the terrible scourge we received in the past few years, would respectfully request the State Board of Health to hold a convention at their earliest possible convenience, in this city, and we will heartily co-operate in making the convention a success:—

A. C. MacKenzie, M. D.,
Joseph Primeau, recorder,
C. S. Lombard, M. D.,
Oscar Dodd, M. D.,
H. W. Sheldon, M D.,
C. O. Bryce, M. D.,
C. F. Cochran, M. D.,
J. H. Sawbridge,
A. Baulsom, merchant tailor,
Joel Williams, merchant,
L. L. Miller, grocer,
John P. Miller, grocer,
Ira A. Clark, city engineer,
W. A. Morse,
John Q. Adams, attorney,
Valentine J. Newman, banker,
M. M. Sanderson, merchant,
John Mitchell, merchant,
Thomas M. Wells, merchant,
Alexander Maitland, president of the First National Bank,
Harris J. Mathews, grocer,
Samuel Mitchell, president Jackson Iron Company,
Charles F. Zukoski, chemist Jackson Iron Company,
E. W. Adams, insurance agent,
J. M. Perkins, druggist,
P. B. Kirkwood,
M. C. Quinn, merchant,
Tid VanAtta, merchant,
B. Neely, merchant,
Christian Jessen, grocer,
Mitchell Bros., grocers,
N. Laughlin, treasurer,
Charles Thoren, tailor,
Morse Bros.. & Co., merchants,
B. E. Cook,
Jose E. Suess,
E. J. Carey Jr., attorney,
Jehill P. Smith,
J. B. Maas, mining agent,
G. L. Kuhlman, merchant,
Anthony Brand, merchant,
Rev. Frederick Strong,
Rev. Charles Langer,
William E. Perry, grocer,
D. McDonald, merchant,

CHARLES M. BROWN, pastor Presbyterian church,
J. L. MCCLEAR, attorney,
J. M. EDGERTON, attorney,
MOSES PLOW, contractor,
JOSEPH WINTER,
R. G. JACKSON, aldermen,
LEWIS CORBIT,
JOHN STEWART,
M. WOLLNER, merchant,
ALEXANDER HEYN, merchant,
BAPTISTE BARASA, alderman.
ROBERT WOOD,
PETER TRUDELL,
THOMAS PELLOW, alderman,
S. P. KLINE,
A. T. CHARMICHAEL, merchant.

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Negaunee, acting with a committee of the State Board of Health.

The following named persons constituted the various committees:—

Committee from the State Board of Health—PROF. DELOS FALL, M. S., Albion.

Local Committee—DR. C. F. COCHRAN, chairman; J. M. EDGERTON, secretary; ALEXANDER MAITLAND, S. P. KLINE, F. D. DAVIS, M. A. GIBBS, P. B. KIRKWOOD, CAPT. SAMUEL MITCHELL and DR. C. S. LOMBARD.

Finance Committee—M. A. GIBBS, J. H. SAWBRIDGE, F. D. DAVIS. JOHN MILLER, WILLIAM MORSE and THOMAS WELLS.

Music Committee—PROF. G. L. JOHNSON, F. M. BENEY and A. M. JOHNSON.

Reception Committee—DR. A. C. MCKENZIE and local physicians.

The officers of the convention were as follows:

President—HON. JOHN Q. ADAMS. Negaunee.

Vice Presidents—

CAPT. SAMUEL MITCHELL, Negaunee;
B. W. WRIGHT, Ishpeming;
DR. T. A. FELCH, Ishpeming;
DR. G. J. NORTHROP, Marquette;
HON. V. B. COCHRAN, Marquette;
PROF. HIRAM OLCOTT, Ishpeming;
JOSEPH KIRKPATRICK, Palmer;
DR. H. M. HASKELL, Palmer;
F. W. READ, Eagle Mills;
PROF. JOHN NORTHMORE, Republic;
WALTER FITCH, Champion;
J. H. SAWBRIDGE, Negaunee;
Dr. OSCAR DODD, Negaunee;
DR. H. W. SHELDON, Negaunee;
A. M. JOHNSON, Negaunee;

Secretary—J. M. EDGERTON, Negaunee.

Some of the non-residents of Negaunee, who were in attendance at the sessions of the convention, were as follows: H. K. Brown, health officer of the township of Breitung, Quinnesec, Menominee county; Rev. Dr. Hurd, president of the Carlinsville University, Illinois; Isidore Freund, M. D., health officer of Champion, Beacon; Mr. Walter Fitch, supervisor and president of the board of health of Champion; George G. Barnett, M. D., health officer of Ishpeming; A. J. Braden, M. D., health officer of Baraga; John Avery, M. D., president and member of the State Board of Health, Greenville; Arthur Hazlewood M. D., member of the State Board of Health, Grand Rapids; Prof. Delos Fall. M. S. member of the State Board of Health, Albion; Mason W. Gray. M. D., member of the State Board of Health, Pontiac; Hon. Frank Wells, member of the State Board of Health, Lansing; and Henry B. Baker. M. D. Secretary of the State Board of Health, Lansing.

FIRST SESSION—THURSDAY, AUGUST 18, 4:00 P. M.

The convention was called to order by the president. After a prayer by the Rev. Frederick Strong, Negaunee, the following address was given:—

ADDRESS OF WELCOME.

BY HON. EDWARD C. ANTHONY, MAYOR OF NEGAUNEE.

Mr. President, Ladies and Gentlemen:

I have yet to win a reputation as an orator. Thus far my efforts in that direction have been confined to special occasions, and under grave provocations: and I have not always been rewarded with that degree of applause which earnest effort should receive. On this occasion I have ventured to prepare a little impromptu speech, because it will be better for being prepared. And because I desire to express to you all the *kindly greeting* and *cordial welcome*, which the people of Negaunee extend to you. On this occasion you have been advised that we are afflicted with the presence of some diseases, more or less epidemic in character, and I suppose this is true; but I am unwilling to believe that we are in any worse condition in this respect, than are other cities, made up, as is our city, of a cosmopolitan population embracing almost all nationalities. This does not mean that I would say we are satisfied with our condition; because, if we were, I would not be here to express a welcome which I did not feel. We will gladly listen to any instruction which the learned gentlemen who are gathered here may be able to impart; and I have no doubt our people will try to profit by it. My observation and experience have taught me, that the people of this city have suffered more sickness in consequence of neglecting to keep their premises in a condition of cleanliness, than from all other causes combined. If this convention shall result in convincing our people of this truth, if no other, it will do a grand work, and the instructors will be entitled to our lasting gratitude. Again bidding you a hearty welcome, in behalf of our people, let me close by expressing the wish that your stay with us may be in all respects pleasant, and the work of your convention profitable.

RESPONSE AND STATEMENT OF THE OBJECT OF THE CONVENTION.

BY HON. JOHN AVERY, M. D., PRESIDENT OF THE STATE BOARD OF HEALTH.

It gives me great pleasure at this time to meet so many of the citizens of Negaunee and, in behalf of the State Board of Health, to respond to the words of welcome so fitly spoken by your mayor.

Your presence here at the opening of this convention, is evidence that you are interested in its objects, and an assurance that it will be a success. People often have an idea that these conventions are held for the benefit of physicians and sanitarians. This is a mistake. Physicians are least interested of any class, and sanitarians are interested only as they afford opportunities to advance public-health work among the people. They are for the people, and we are glad to see the people here; we want them to feel that this is their convention; we want them to become interested it it, to take part in its proceedings, to ask questions and to discuss any topic that is presented before it. If they will do this the benefits will not

remain alone to those who participate in its proceedings, but will extend to all who have access to its printed reports, and to all who shall in any way come under the influence of its teachings. This is a "government of the people, by the people, for the people." The people make and enforce the laws for their own protection and security of personal and property rights. If they do not see or understand the necessity for a law, they will not enforce it. Public-health laws are designed for the protection of the people. When people fully understand the importance and necessity for these laws they will see that they are enforced.

There is a Chinese myth or legend to the effect: That more than two thousand years ago, a young emperor, on coming to the throne of that great empire, sought to find the "way" or principle upon which government rests. He believed there was a *way* which when once found would make government easy and simple. So he studied much, traveled much, inquired of wise men far and near, and sought it in the solitude of wilderness and mountain. After long search, he heard that the way could be found in the Mountain of Wisdom outside the world. (The world was the Empire of China.) He traveled a long distance until he came outside the world, where he found a young lad tending a herd of horses. He asked the boy if he knew where the mountain was. The boy said he did, and it was a long way off. He asked if he knew the *way* of government for an empire. He said he did. The *way* for an empire is the same as for these horses. The Emperor, astonished, asked how that could be. The boy replied "to see that no harm comes to these horses, and to see that no harm comes to the people of the empire."

The Emperor had found the *way*; and, prostrating himself before the boy, returned to his empire and ruled it long and wisely. And now, after more than two thousand years of experiment in governing, no better way has been found, than "to see that no harm comes to the people."

Self government implies self protection. Power comes with knowledge. Once show the people the way and they will follow it. Pestilence is an ever threatening danger. To learn how to protect your community from those diseases that waste your substance and destroy your youth, namely, typhoid fever, diphtheria, scarlet fever and the like, is then the object of this convention to which we invite your attention. Thanking you for your attendance and attention, I bespeak for you increased interest as the program proceeds.

There was no formal address by the president of the convention. Hon. J. Q. Adams, the president, made a few introductory remarks, and announced Hon. Frank Wells, member of the State Board of Health, as the next speaker on the program.

THE GERM THEORY OF DISEASE.

BY HON. FRANK WELLS, MEMBER OF THE STATE BOARD OF HEALTH, LANSING.

The history of the discovery of microscopic organisms and the important influence they exert both in inorganic and organic nature, though brief in point of time, is almost startling in the importance of its record. For the chemist, the physiologist, the sanitarian, the physician, and the student of nature, the new knowledge of this microscopic world possesses an interest and value far beyond any of the other discoveries of modern science.

The infinitesimal and varied organisms of which this history treats have

been shown to be, in great measure, the means of life and the cause of death. Their potent influence is ever present either for weal or woe. Without them the body would starve, and yet they strike down as ruthlessly and as certainly as the assassin's dagger. Moving with us along the current of our existence, these "spirits of the air" are ever contending for our possession. Arrayed on one side are those coöperating with life and health to prolong our existence; upon the other, ten thousand foes assail and constantly seek some unguarded spot upon which to plant the insidious seeds of disease and death. But their work of destruction is no sooner accomplished than other myriads seize the stricken victim and prepare him again for life. In this way goes on forever a series of grand phenomena which owe their existence to the part performed by these creations which the unaided eye has never seen.

All that lives must die; and all that dies must be disintegrated and changed into the elements of which it was composed in order that it may be fitted to enter upon new cycles of life. This change we call fermentation, decomposition, putrefaction, and oxidation. A tree, a plant, or an animal falls and soon disappears. But whence has it gone, and how?

To whatever kingdom it may have belonged, its history presents these general characteristics. A single cell of protoplasm inherited from a parent was the first token of its existence. This cell, after increasing in size, divided itself into two, the two into four, the four into eight, and this method of multiplication continuing until the organism was complete. As these cells increased in number, they differentiated themselves into tissues, organs, and systems, adapted to the various functions required by the plant or animal in process of creation, and prescribed at the outset by the mysterious but potent influence of the primordial cell. All the material from which this complex structure was composed came either directly or indirectly from inorganic nature, and must at death be returned to this same great source. Whether it be the modest violet or the lordly oak, the tiniest insect or man himself, the creation is formed of simple chemical elements arranged in a complex and unstable form, constantly undergoing change and decomposition, and thereby evolving heat and force and motion.

As long as life continues, these chemical processes, to which we give many names, are sustained by means of the lavish material which earth lends so liberally to her children. That she only lends, is a very old story. The manner by which she exacts a return of the last atom she has lent, is a new story. The old belief concerning this manner, accepted by chemists until within a recent period, held that the oxygen of the air communicated a molecular motion to particles of dead matter, which produced fermentation, and thus resolved them into new products or into their original elements. The new belief, which is not now merely a belief but a demonstrated fact, is that living organisms cause the ferments which produce these changes.

In the words of a distinguished naturalist "a third kingdom has been discovered. The inhabitants of this kingdom are never idle. They leaven our bread, curdle our milk, cause our fruit to decay, addle our eggs, and decompose for new life the 'autumn leaves as they fall to enrich our mother earth.'"

Though knowledge of the existence of microscopic life was coeval with the discovery of the microscope, little importance was attached to such knowledge, until the connection between it and putrefaction was estab-

lished by Schwann in 1837. The discovery by Cagniard Latour, a year previous, and of Schwann independenty about the same time, of the yeast plant and of its wonderfully rapid cellular growth, had led to a hypothesis that a relationship existed between this organism and alcoholic fermentation.

This hypothesis was recognized by Dumas and many other chemists as very probable; but as no similar cause had as yet been discovered for other ferments, this was regarded as a mere incident and of no scientific value. Many memoirs were published at this time upon the subject, nearly all of which agreed with the teachings of the learned Liebig that life exercised no function in the process of fermentation. From this opinion a few dissented, taking an entirely different view of the whole matter.

It was at this time that the spirit of scientific investigation, which has become such a marked characteristic of our own day, was stimulated into intense activity by the works of a new generation of thinkers. Among these, none has left the stamp of his genius and labor more impressively upon his generation than Charles Darwin. The theory he so ably advocated was itself a result of that theory in its application to the thought of the age, and furnishes the reason for its early acceptance and adoption by so many. His teachings were at once carried by the enthusiasm of his followers far beyond his own belief, and made the basis for numerous other theories. Among the most reasonable of these was one advocating the spontaneous generation of life. If the descent of man, it was argued, can be traced by gradations to the lowest living organisms, will not a step below this point reveal the very beginnings and cause of life?

It was proved that decoctions of vegetable and animal substances, capable of sustaining life exposed to the air, invariably showed evidences of vitality, and this was claimed as proof of its spontaneous generation.

But the history of science is a history of the overthrow of theories and beliefs, many of which have swayed the world for years and even centuries. Such has been the fate of the theory of spontaneous generation. It has been shown to be a chimera. During all the period it was so generally accepted, there were those who doubted the efficiency of the tests which had proved convincing to so many; and in the year 1857, a young chemist and naturalist who had already won a reputation for originality of research, accuracy in experiments, and close reasoning, had his attention called to this subject. Though strongly dissuaded by earnest friends from a study of this obscure question, and warned that in entering its labyrinth he would never escape, this earnest seeker for truth would not be discouraged by the difficulties which surrounded the problem, and decided to attempt its solution.

The result of his efforts in this and the kindred lines of research to which it led, has not only settled the question of spontaneous generation, but has placed the name of Louis Pasteur high up on that immortal record of nature's pupils who have learned grand secrets from their teacher to aid their fellow men.

He instituted a series of experiments interesting and ingenious in themselves, and especially decisive in their results. Time will permit me to describe them only in a very brief and general way. He placed putrescible substances in flasks with long necks. The neck of each, by means of a blowpipe, he drew out to a small diameter, at the same time bending the soft glass to and fro so as to form a sinuous tube, the extremity of which was left open. He then boiled the contents until vapor came out in

abundance through the long winding tube. It follows that the external air is met at first by the hot vapor, and can only enter very slowly as the substance cools; so slowly, in fact, that the germs it contains, capable of producing living organisms, are deposited in the bends of the still moist tube and fail to reach the liquid. Under these conditions the substances in these flasks remain unchanged for months or years. If, however, at any time the tubes are broken off close to the flask, permitting free ingress of air, evidences of life in varied forms will appear within 48 hours. Pasteur next showed, in the following simple manner, that the dust floating in the air contains the germs of life. Through a tube stoppered with cotton he drew ordinary air. In passing through the cotton the air was filtered, depositing therein all its dust. Placing a drop of the water, obtained from washing this cotton under a microscope, there were shown in the midst of fragments of silk, wool, cotton, and particles of soot, organisms in great variety belonging to the vegetable or animal kingdom, mingled with eggs and spores of infusoria.

Having thus proved that air contains the germs of life, under ordinary conditions, and that no substance exhibits evidences of life when itself freed and brought into contact with air freed from these germs, Pasteur now showed that the quantity of germs contained in air varied greatly in different localities. They diminish in number where human habitations are few, and also in high altitudes. Of the flasks just described, Pasteur opened 20 in the country far from all residences, and the air permitted free access to their contents, after which they were sealed. Of these, eight subsequently were found to contain organized products. Twenty were opened and closed in the same manner on the Jura, five of which were altered: while of twenty opened on the Montanvert in face of a strong wind blowing from the glacier, one alone showed evidences of life.

About the time Pasteur was conducting the experiments we have described, Tyndall was engaged in similar investigations in England; these, though differing somewhat in method from those of Pasteur, reached the same result. The conclusions of these two distinguished investigators, that life does not exist in the world at the present time, except as a product of similar life which has preceded it, has now been accepted and adopted by scientific thinkers everywhere.

Side by side with all these researches and discoveries has run the germ theory of epidemic diseases. The similarity of much of the phenomena of such diseases with those which characterize the lower orders of life are perfect.

Nearly two hundred years before the decisive experiments of Pasteur on fermentation, the distinguished physicist, Robert Boyle, had said that "the phenomena of certain diseases will never be properly understood without an insight into the doctrine of fermentations." This similarity of the etiology of virulent diseases and the action of ferments was too strongly marked to have escaped the attention of physicians, and the belief of Boyle was largely shared by succeeding generations of investigators into the causes of epidemics.

The chemical theory adopted and taught by Liebig upon fermentations was applied to the viruses of contagious diseases, and the latter, like the former, were said to be the result of motions proper to substances in course of molecular change. The researches of Pasteur, showing ferments to be microscopic organisms, at once prepared the minds of thinkers everywhere for the new theory that contagious diseases also result from the presence

of these organisms. This, however, had yet to be demonstrated, and Pasteur set about the work with his accustomed skill and zeal.

The attention of Pasteur was first directed to an epidemic which in 1849 fell upon the silk worm nurseries in France. This he undertook to investigate and seek a remedy. Two years were spent by Pasteur, his wife and daughter in this work. He demonstrated that the disease was caused by minute organisms which not only attacked the worms, but in their germ form were found within the tiny eggs of the moth. Careful selection and isolation of uncontaminated eggs was the successful remedy finally reached. Though this has required vast patience and time it has resulted in restoring wealth to an almost ruined country, and joy to a despairing people.

Pasteur next attempted to penetrate the mystery of a disease which for centuries had decimated the flocks of France and other countries called anthrax. His method, which had now served him for twenty years, was simple and conclusive. A drop of anthrax blood was placed in a flask of some suitable infusion, previously sterilized by boiling to free it from germs. In a few hours it was filled with myriads of bacteria. A drop of this first cultivation sown in a second flask, prepared in the same manner as the first, showed itself no less fertile. This was continued through twenty or thirty similar cultures, always with the same result. A minute quantity from the last culture, introduced at any time under the skin of an animal, would produce death from anthrax in two or three days. A great and valuable scientific fact has been demonstrated. The virulence of this disease was found to be due to living microscopic organisms.

An epidemic among fowls and chicken cholera was also found by Pasteur to be the result of a similar cause; and the disease, capable of transmission through cultures, inoculation with any of which, produced all the characteristic symptoms of the malady followed by death.

Pasteur's mind had long dwelt on the discovery of Jenner, and upon the significant question which it suggests that if one recurrent disease may be prevented by producing a mild form of such disease, why may not many others? In causing the microbe of fowl cholera to pass from culture to culture in an artificial medium, Pasteur permitted an interval of 24 hours to elapse between the time of sowing each successive culture. He then studied the effect upon the virus of increasing this interval. He found that when this was continued for several days, weeks, and even months, the contagium became weakened in power in proportion to the length of the interval. A virus permitted to remain in a flask, the mouth of which has been protected from the introduction of foreign germs by a stopper of cotton wool, for three months, if used to inoculate fowls, will render them more or less ill, but fails to produce death. But, if this fact is extraordinary, the one which follows is much more so. If, after these fowls have recovered from this inoculation, they are reinoculated with a virulent virus or that which produces death in the uninoculated, they are scarcely even made ill. The conclusion from these facts is irresistible. The disease can protect from itself; and like most if not all virulent diseases, it cannot attack a second time. The enfeebled microbe is shown to be a real vaccine, its power becoming attenuated in proportion to the time of its exposure to air. At any stage of its enfeeblement, the virus may be kept, by being protected from the oxygen of the air in hermetically sealed glass tubes, for months or even years without change.

Could the microbes of splenic fever be attenuated so as to produce a vaccine for that fatal malady, was now the question Pasteur was called upon

to face. The microbe which produces anthrax, like most similar organisms, reproduces itself by fissure or division while that of chicken cholera forms spores similar to the seed pods of plants. These spores may be exposed to the air for years without losing their virulence, but are always ready to reproduce their kind and manifest their power whenever they have found lodgment in the bodies of animals. After much researeh, Pasteur learned that below a temperature of 45° anthrax bacilli produce no spores, and may be cultivated and attenuated in the same manner as those of chicken cholera. It is difficult to estimate the value of the practical effect which followed this discovery. Sheep and cows were vaccinated as rapidly as the virus could be obtained, and almost certain immunity was secured from the ravages of this malady.

The parasitic origin of epidemic diseases in animals having been demonstrated, investigations now turned toward the same class of diseases in man.

Students in great numbers immediately entered this realm, and the knowledge they have gained has raised to a science, that which a decade ago had not reached the dignity of a theory. Lister showed that a very large proportion of the serious results following surgical operations were due to the action of living organisms; and that these results could be avoided by the use of substances which destroyed the life of such organisms. Next to chloroform this discovery has amplified the field of the surgeon until today operations are successfully conducted which, a few years ago, would have uniformly proved fatal.

Dr. Robert Koch, of Berlin, already in his own country at the head of investigators of the mysteries and character of microscopic life, announced in 1881 that he had discovered tuberculosis to be due to the presence of a peculiar living organism. He had found a characteristic and hitherto unknown bacillus in all tubercularly altered organs. They appeared as slender, rod-shaped organisms, and were present in vast numbers, both separated and crowded into small, dense groups. He discovered them in all animals in which the disease existed, and in monkeys, dead from consumption, they were seen in countless bunches, pervading nearly all the internal organs. They have no motion but that of growth; and, in the body, form spores which may float in the air and retain their virulence for a long time. They are readily cultivated in artificial media, and these cultivations can be made to produce the disease by inoculation. Though successfully resisted by the life of a healthy lung any hereditary or acquired predisposition, which favors an inflammatory or congestive condition of this organ, may permit the lodgment and destructive work of this malignant and deadly parasite. This distinguished bacteriologist is also entitled to the credit of discovering the organism which causes that most terrible of all epidemics, Asiatic cholera. That success has failed to crown the grand effort of his life to furnish to the world a method for protection against the ravages of consumption, is a most bitter disappointment. That effort in this direction will some time make available the knowledge we now possess to save humanity from the grasp of this infinitely small but terribly powerful destroyer, is the belief of many and the hope of all.

Every species of microörganism has a distinct family form which never varies except, as do plants, through growth and changing conditions. *Bacteria* is a name now quite commonly used for all, though originally applied to those the length of whose bodies were several times their breadth. *Bacillus* is a term for a still more slender body. Both appear

frequently in long chains. These vary greatly in size, an average length being about one twenty-thousandth of an inch. *Micrococci* are small points or specs and form a very extensive class.

How do these minute forms which only the most powerful microscope is able to reveal to the eye, and then only by the aid of stains which affect differently the organisms and the surrounding medium, produce disease?

Many answers to this question have been presented. Another question allied to this, and of equal interest, is that of the means by which an attack of many diseases like measles, whooping cough, etc., renders the body proof against a second attack.

While it is evident that disease producing germs within the body may affect functional activity and seriously interfere with vital processes, yet it is apparent that such merely mechanical influences cannot produce all those destructive effects which signalize their advent. Among the earlier beliefs most generally favored was that certain constituents of the body, necessary for the existence of the parasites which found within it their home, became exhausted. The objection to this belief is that the body is never so generally under the control of these organisms as to yield to them all its available nutriment. Besides if the body should become depleted in this way, the supply, upon the removal of the cause, would be renewed.

The Leucocyte theory has many adherents. This theory is based upon the well known fact that the white blood corpuscles remove from the serum effete particles that have performed their functions. These leucocytes seem to possess an independent existence and are analogous to those primitive forms of life whose single cell of protoplasm serves for stomach, and all the other organs of the more highly organized creations. They have the power of motion and wrap themselves about the food they wish to absorb. It is claimed that disease-producing organisms, entering a blood vessel, are at once assaulted by these corpuscles, and if possible destroyed. When it happens that the invaders are too numerous or too strong for their adversaries, disease and perhaps death to the body follows. There is much to make this theory seem plausible, notwithstanding the claim that leucocytes are scavengers rather than fighters. It is maintained that they are merely buriers of the dead, or, rather, open graves prepared to receive the bodies of the enemy, and not the soldiers who destroy the lives of invaders. While the microscope has been constantly opening up to our vision facts relating to these obscure questions, the aid of chemistry has been invoked to help us to understand the significance of the revelation.

It had been long known that during the changes taking place in a lifeless animal or plant, as its cellular structure was being broken down and resolved into their original elements, peculiar chemical substances were produced. Many of them had been analyzed and their composition proven. These products were known under the general name of Ptomaines.

They were invariably found to be the results of bacterial action, in the processes of fermentation and putrefaction. A large proportion of them were extremely poisonous. In many cases the most minute quantity introduced into a healthy animal would quickly affect the entire body producing serious disease and death. These effects were analogous to those of the sting of a bee, the bite of a venomous reptile, or rabid animal, where absorption of the smallest amount of poison is followed by rapid, extensive and often fatal consequences. Knowledge of ptomaines and

their influence naturally led to the inquiry: why may not living tissue, equally with dead, exhibit poisonous ferments, when acted upon by bacteria. Cultures of organisms known to be the causes of various diseases were sterilized by heat and filtered. Such filtrates though entirely deprived of life were found when introduced into the bodies of animals to produce all the characteristic symptoms of inoculation by the organisms themselves. This discovery has marked a long advance in our knowledge of the methods by which disease-producing germs perform their work, and has thrown much light upon the questions we are considering.

It should be added that the poisons set free by these germs have been subjected to chemical analysis and their properties, like the ptomaines, have been expressed in chemical symbols. I can only allude to the important work of Dr. Vaughan, member of the State Board of Health, in discovering and isolating the poison produced in milk and cheese, which he named Tyrotoxicon. The same eminent bacteriologist and his assistant, Dr. Novy, have obtained from cultures of the typhoid bacillus, found in drinking water which had produced typhoid fever in persons using it, an extract which caused cats to exhibit all the symptoms of the disease, with characteristic intestinal ulcerations.

Finally, chemistry, while throwing much light upon the problems, has greatly increased their complexity. We see clearly that much is yet to be learned before we can consider them satisfactorily solved. Some things, however, we are sure of. We know that a large proportion of the diseases to which the human family is subject is the result of the life processes of microörganisms within the body; we also know that most of them are preventable. It will be for the various scientific gentlemen, who will address you during this convention, to point out how this may be accomplished.

DISCUSSION.

The discussion of the subject of the "The Germ Theory of Disease," by E. J. Mellish, Ishpeming, was not in manuscript form and is not here reproduced; but some of the points made by Dr. Mellish were noted and are here printed:

E. J. Mellish, M. D. Ishpeming—Thirty per cent of the population of the globe die from germ diseases which are preventable. Consumption, diphtheria, scarlet fever, typhoid fever, measles, pneumonia and small-pox are now known to be germ diseases. Typhoid fever can be prevented by boiling the drinking water and by having a pure water supply. The drinking water from wells is impure and unsafe. The diseases which we should first try to prevent are those which the people will accept as preventable. Consumption causes more deaths than diphtheria and scarlet fever.

SECOND SESSION—THURSDAY, AUGUST 13, 8:00 P. M.

The convention was called to order by the president. After a vocal solo by Miss Josie Gaffney, the following address was delivered:

THE WATER SUPPLY OF NEGAUNEE.

BY C. S. LOMBARD, M. D. NEGAUNEE.

Most of our drinking water is obtained from 480 odd acres of water just over the bluff, about half a mile away. This source of water supply is a quiet, glassy little pond, without motion except when disturbed by wind, that is, it has no current.

At certain seasons of the year, when the snow melts or when long and heavy rains occur, a stream of water varying from a mere distinguishable rivulet to a brook four feet wide and a foot in depth marks the location of the old time natural outlet; the suction pipe of the city water-works is the real outlet now. The water of our little lake is somewhat "off color," and the decaying vegetation, with a certain amount of dissolved peaty products, is the principal cause of it ;it is always cool, even in summer.

Mr. Thompson, civil engineer for the Lake Superior mine at Ishpeming, informs me that Teal Lake has an area of about 21,000,000 square feet. The total water-shed of the lake is about 56,000,000 square feet, making a total of 77,000,000 square feet. The average annual rainfall for this county is 31.6 inches, making a total average of 2,997,600 gallons upon the water-shed and 1,133,500 gallons directly into the lake. Of all the rain that falls upon the water-shed a liberal estimate allows six-tenths of the whole to find its way into the lake—*directly* from the surface and *indirectly* through the medium of springs. There enters, therefore, into the lake a daily average of 2,932,000 gallons. Deducting the average daily evaporation of water from the surface of the lake, amounting to about 1,333,360 gallons, and we have left 1,598,700 gallons; of this amount about 1,400,000 gallons are pumped daily from the lake by the water-works, leaving nearly 200,000 gallons unaccounted for, which amount, and possibly as much more, finds its way to the lake by means of a small brook which empties upon the north shore and which has its rise several miles further north.

The Cambria, Lillie and Hartford mines pump from 250,000 to 300,000 gallons daily into the lake, but that amount is accounted for in figuring the amount that reaches the lake from the water-shed. If the mines will pump their 300,000 gallons away from the lake instead of into it we should have left possibly less than 100,000 gallons, which can readily be accounted for in the small brook just alluded to upon the northern shore, which brings water at certain times of the year from a far-away swamp. How much remains to appear from the supposed "fountains of the great deep," the wondrous and time-honored springs that were supposed to gurgle from mysterious throats of the icy north; that formed connections, as it were, with some far-away northern Waukesha or Saratoga; how much remains we shall need to search for—search for in vain.

The fact that we are much higher than any surrounding country which could possibly supply us with water by an underground channel proves

conclusively that these much vaunted "springs" are merely the surface seepings—the filterings of rains and melted snows from the natural watershed of the lake.

The water pumped from the mines into the lake comes from the same source, that is, it is rain-water which has filtered through the sand, run into rocky crevices and found its way, at length, by gravity, to the "sump" where the miners find it and "fork it" back to the surface. Thus we can trace all the water that enters Teal lake back to its source of rain and snow through very shallow ground. The water pumped from the mines is deeply colored with hematite and, on a quiet day, the lake may be seen stained for over half a mile by this influx. It does not, however, affect the quality of the water to a noticeable degree near the suction pipe.

A certain amount of *organic* matter enters the lake mingled with the water from the mines but, whether or not in quantities sufficient to contaminate it, can be ascertained by analysis.

Millions of feet of logs are floated upon the lake. They can be seen at all times of the year near the saw mill or far away "hung up" upon the shore. A track has been built close to the lake, where logs brought from a distance are rolled from the cars into the lake where they remain to soak or sink, awaiting the convenience of the sawyer.

What of the savory slaughter houses? Take a walk with me, and, if the sights and smells prove too much for your delicate stomachs, my object (excuse me) will have been partially accomplished. Don't take my word for a thing but go with me, and I will show you where the late heavy rains washed the putrifying remains of slaughtered beasts, the blood, the putrid waste of maggots, the clotted carrion of unnumbered carcasses, the fecal filth, the rotten remnants left forsaken even by the digusted crows, washed them in an eddying flood down the sanded slope directly into the lake. Go a little farther and I will show you the stinking remains (excuse my illustrations, they are hardly strong enough) of three dead horses within one hundred and fifty feet of the lip of the basin out of which you obtain the water to make your delicious cup of coffee.

Some two years ago, when some careless people called attention to the condition of our water supply, they were brought up with a sudden jerk and told they were "injuring the prospects of the town." When it was insisted that the water was vile and that the people were having pumped down their throats, not water but *sewage* or *something worse*, they let loose their war hounds and the scene grew dark. Some of them said that they "never drank such delicious water before in their lives," but they knew they were lying at the time. Others did not dare open their mouths, and the public was in the hands of the few whose nod was law.

I do not say that Teal Lake was responsible for every death from typhoid during the summer and fall of 1889, but hear these reports:

CHEMICAL ANALYSES AND BACTERIOLOGICAL EXAMINATION OF WATER FROM NEGAUNEE.

BY PROF. V. C. VAUGHAN, ANN ARBOR, MICHIGAN.

Chemical analysis of water from city service pipes.

Free ammonia	22.8	and	23.2
Albuminoid	36.8	"	46.0
Chlorine	3.0	"	3.0

Nitrates	Trace. and Absent.
Nitrites	Trace. " Absent.

Both samples are swarming with germs and we are now trying the effects of them on animals.

V. C. VAUGHAN.

Ann Arbor, October 5, 1889.

The foregoing samples were known as samples Nos. 1 and 2.

C. S. LOMBARD.

Analysis of water taken from Teal lake, 50 feet from the crib.

Free ammonia	0.296
Albuminoid ammonia	0.448
Chlorine	4.0
Nitrates	Trace.
Nitrites	Trace.
Hardness, Clark's scale	2.5°

Reaction neutral, odorless, clear. V. C. VAUGHAN.

October 19, 1889.

Bacteriological examination of Negaunee city water, known as samples Nos. 1 and 2.

No. 1	920 germs per drop.
No. 2	1,240 " " "

Cultures of this germ in sterilized beef tea were made, kept at temperature of the body 24 hours and then injected into the peritoneal cavities of rabbits; all of the rabbits (four in number) treated in this way died, three of them in 24 hours and one in 13 days, etc., etc.

V. C. VAUGHAN.

December 9, 1889.

Report on the bacteriological examination of typhoid stools and of the organs of a man dead of typhoid fever sent from Negaunee, and general conclusions concerning the relation of the impure drinking water and the typhoid epidemic.

In my report upon the bacteriological examination of certain samples of drinking water sent to me from Negaunee, I stated that I had found in these waters a pathogenic germ which is fatal to rabbits.

I have to add the following:

1. In the stools of a person sick with typhoid fever at Negaunee I have found the same germ which is fatal to rabbits.

2. From the spleen, kidney and liver of a person dead of typhoid fever at Negaunee, I have found the same germ, and when taken from these organs it is equally fatal to rabbits. I am therefore forced, in view of all the evidence, now before me, to conclude that the chain of evidence against the impure drinking water is complete, and I have no doubt that the cause of the epidemic originated in and was due to the bad water.

Respectfully,

V. C. VAUGHAN.

December 17, 1889.

The foregoing is an exact copy of Prof. Vaughan's statement.

C. S. LOMBARD, M. D.

Strange coincidence wasn't it? There were hundreds of cases of typhoid fever, the vilest water ever examined by the State chemist, barring one exception, rabbits and guinea pigs were killed by a single drop of it and yet some say: "All bosh, the *water* did not cause the fever!" Be this as it may, if our city is again visited by another such epidemic—an outbreak of from 350 to 400 cases and a fatality of nearly ten per cent—and the water be found as vile or anything near as vile as in '89 the responsibility will rest upon our city officials and an enraged public may be excused if they "call your negligence by the name of crime."

One analysis of Teal Lake water made by Victor C Vaughan, State Chemist, during the month of November 1890, is as follows:

Total residue 680. parts per million.
Organic residue 80. parts per million.
Albuminoid ammonia .820 parts per million.

Parts of potassium permanganate reduced by organic matter of water 73.432 parts per million. Germs per drop, 12.

Mark what a wonderful improvement over that of 1889. I will not attempt to explain the reason for such an improvement but mark that it is still a corrupt water. You observe that the amount of albuminoid ammonia contained in the water is very great, and the albuminoid ammonia is derived from the decomposition of animal matter. I believe that slaughter-house filth will reach down into the third and fourth generation, hair and hide and something worse will last--how long? But what shall we do about it? I recommend that an investigation be made. When that has been done you will agree with me that *some*, at least, of the houses, barns and sheds, standing within an eighth of a mile of the lake be wiped from the face of the earth, that others be moved farther away and no new ones allowed to be built in their places. Not only this but the filth found upon the banks should all be removed and the shores kept clean.

As if to get ready for this convention old mother nature rolled up her sleeves last week, put on her scrubbing garments with fire in her eye and swollen countenance, scowled, thundered and let go her wrath in torrents with a vengeance that shook and tore the rocky hillsides, deluged the forests, the swamps, the barn yards, the back yards, gutters and everything high and low until they became cleansed and purified. But where did our good washerwoman dump some of her foulest wash water? Where are the leachings of the Cambria location? Where are the sloughs of the slaughter-houses, the tissues of dead horses, the dregs from the dung-hills? Gone down the gullets of some of the people—a portion of it! And what has not, is being mixed by the pestle of the winds in the rough mortar of the lake; and who will have the next glass of it?

Further: The water pumped from the mines into the lake should be analyzed. No man's "say so" without an analysis is worth the hearing. If, as some say, these pumpings are filled with organic matter, human excreta, etc., we want to know it and take steps to prevent it. But such water will need repeated analysis, for where hundreds of men are working hundreds of feet under the ground, in dark "drifts," some nuisance must be committed; and that nuisance finds it way into the lake---it is pumped there from the mines' "sump." With a magnanimity characteristic of the man, Mr. Maitland, I am informed, has signified his willingness to pump all the water from the Cambria and Lillie mines, over the hill, away from the lake. This is as it should be and will remove one possible source of filth.

With regard to the logs, I do not see why this lake, the purity of whose waters should be our pride, as much so as the purity of our wives and daughters—I do not see why this lake should be made a vat for the infusion of tons of decaying bark and myriads of mouldering worms, or why, within a few feet of the mouth of the "supply pipe" of our water system should float the sloughing carcasses of a raft of slimy saw logs. Don't tell me that this filth is all oxidized; that the water purifies itself by the action of the air and its own motion. Throw a dead rat into a tub of water and tell me the same thing! The body of water is too small; the motion of the water is too insignificant; were it not for the wind it would be

green with the scum of stagnant nastiness. But, "as you like it," my friends.

I do not comprehend the justice of the law that permits the diffusion of the lethal rot of millions of saw logs throughout the drinking water of a city, that welcomes the offal of slaughter houses, that smiles at the inflow of acres of human and bestial filth, that laughs at a chemist's analysis, and yet with a majesty befitting the imperial mandate of an emperor swoops down upon the innocent school boy who chances to dip his toes into the sacred slime of yonder pool. I confess that I do not comprehend it! Away with your slaughter houses! Down with the hovels that infest the lake shore! Banish your "sump water"; and, if we *must* have one little nuisance, let the dear boys swim!

But we don't want any nuisance! If that little reservoir of 480 acres had been built by man, he would have fenced it, where necessary, to keep out the cows that now wade and wash in the shallow waters of the shore, how much less should we abuse the bounty of the Almighty? Fence it then as you deem necessary, fill up the drains and ditches that lead into it and with the other improvements finished we shall have a drinking water as good as that of Lake Sally or any of the other numerous upland ponds of the Upper Peninsula, but nothing to compare with the blue purity of Lake Superior.

It has been urged as an excuse for the "do-nothing-policy" that we are no worse off than some other towns not far away. This is so childish that I'm really ashamed to mention it. As well might the drunkards or the harlots point to other human wrecks as an excuse for their own folly.

That water should be analyzed once or twice every year; and, when found below a certain standard of purity, the cause should be earnestly sought for and removed. The mere matter of expense should not be considered for a second. There is nothing on earth *so expensive as a funeral.*

You are not satisfied unless your ore is repeatedly analyzed; and, when your chemist tells you that it is low in iron and high in phosphorous, your jaws drop and the gold eagles in your pockets fairly sicken with despondency--it is the next thing to telling you there's no ore at all; "it's all pinched out." But when water is analyzed it must be as you think it, as you wish it, or "it's all bosh!" If sent to a chemist, whose ability and integrity is recognized as inferior to none upon two hemispheres of the earth and a report is returned such as has been read here tonight, you growl, shrug your shoulders and like St. Peter begin to curse and damn and say, "Teal lake water is all right and we know it!!!!"

Gentlemen, it is my turn to talk now and I want to tell you that kind of talk you didn't mean, it was not your conscientious opinion, it was mere bluster and you would not be placed on record as having contradicted the analysis of Prof. Vaughan. All this is gone. The reaction rises now and everything will work for the best, I hope. Let us see, there are about thirty saloons in town; no more here than in any other mining town of a like size; we are not a colony of total abstainers by any means; we have whirlpools of whisky and billows of beer, but not one drop of water such as would gladden the heart of even an inhabitant of "darkest Africa."

I know that I have incurred the enmity of certain ones in the audience by the use made of plain language, but citizens of Negaunee please credit me with having spoken the truth, let the results be what they may.

DISCUSSION.

ALEXANDER MAITLAND, Negaunee: I desired to have Dr. Lombard write this paper on our water supply, for I knew he would paint it as black as possible, and in this, I am not disappointed, for he has dipped his brush into the blackest paint he could find and daubed it on very thick. I presume it is bad enough, and anything that can be said or done to improve our water supply should be tolerated.

The term watch-dog of the treasury has been applied to those who have been very zealous in guarding public trusts intrusted to them. The term watch-dog of the public health may be applied to our physicians. It is particularly so in this section, where our doctors are employed by the month; it is to their interest to prevent sickness and disease. I never knew a physician but who did everything he could to prevent sickness, but with us it is to his pecuniary interest to do this. The less sickness we have the more money they make. This is commendable, if not carried too far; but he should not raise the cry of epidemic when he has a few cases of the so-called preventable diseases that are affecting his pocket a little.

Our lake is not a stagnant pool by any means; the inlet is very small, in fact, during the summer months, little if any water runs into the lake. The fact that our pumps are pumping nearly 1,000 gallons per minute or 1,440,000 gallons a day, with a good sized outlet would indicate it was fed from other sources than the rain fall.

The discussion of the subject of "Water Supply," by Prof. Deloe Fall, M. S., member of the State Board of Health, Albion, was not in manuscript-form, and could not be here reproduced.

DIPHTHERIA AND SCARLET FEVER.

BY MASON W. GRAY, M. D., MEMBER OF THE STATE BOARD OF HEALTH, PONTIAC, MICHIGAN.

No department of science has been characterized in recent years by greater activity than that devoted to sanitation; and at the present time no investigations are pursued with greater zeal, and none promise more for the welfare of mankind than those which relate to the causes and prevention of disease.

The workers in the field of preventive medicine have shown us, that many of the most fatal diseases are communicable. That a large proportion of their causes are removable, and what is more important, they have demonstrated that these diseases may be restricted and prevented.

The two diseases, which I have been invited to discuss this evening, waged an unrestricted warfare against society for years, perhaps for centuries, until their causes and nature were understood, and sanitary science taught us how to restrict and prevent them. Diphtheria, which has been described as "one of the most dreaded, one of the most fatal, and unfortunately one of the most common maladies of childhood," *was brought to this country from the old world about two hundred and fifty years ago. Appearing first in the vicinity of Boston, it gradually invaded the surrounding colonies. Thus established in New England, it slowly

*Dr. J. Lewis Smith, article on diphtheria, in Cyclopedia of the Diseases of Children.

spread westward. Since 1850, however, its dissemination has been more rapid, owing to the greater density of population and the greater facility with which the inhabitants of different sections of the country might mingle with each other, until at the present time it is known in every locality within our national boundaries.

The fearfully fatal character of the disease, and its gradual extension along every highway and byway of civilization, excited widespread interest among physicians and sanitarians. I think it can be fairly stated that no medical subject has been so frequently and fully discussed during the last two or three decades; therefore, the American literature on diphtheria is abundant and rapidly accumulating. As a result of all this it has come to be generally recognized that this disease is one of the most dangerous maladies we have to combat, and one over which the physician has no positive methods of control, when he has to face it after it has found a firm foothold. Bearing in mind these facts, we must all agree that preventive measures against diphtheria are imperatively demanded. An eminent writer states: "By the cultivation and simplification of preventive measures we may in the future triumph over infectious diseases. It is in this direction that the medical profession will be powerful for good, and the intelligent physician will come to an understanding with himself, as to his duty in preventing diphtheria when he can, and treating where he must."*

We have seen how steadily and surely diphtheria overran this country, when it was little understood, and, consequently, unrestricted by preventive measures. Within the past few years, comparatively, the disease being recognized as contagious in character, efforts have been made to control its spread. In those states having State Boards of Health, the results have been gratifying. In New York city the efficient health board has, during the last ten years, considerably reduced the comparative number of cases of sickness, as well as the number of deaths. In Michigan the State Board of Health, aided by the local boards, has been doing a work since its organization, the results of which already prove that, with more general interest among the people, a continuation along the same lines will, in the future, subdue not only diphtheria, but all infectious diseases.

In 1888 there were 311 outbreaks of diphtheria in Michigan, outside of Detroit and Grand Rapids; and in only 58 of those outbreaks were the directions of the State Board of Health, with reference to isolation and disinfection, completely carried out. But in those 58 outbreaks, there was an average of only 1.74 cases per outbreak and an average of only .53 deaths per outbreak. In the balance of the 311 outbreaks the methods recommended were either totally neglected or only partially enforced. In 34 outbreaks isolation and disinfection were wholly neglected, with an average of 15.50 cases and 2.38 deaths per outbreak. By studying the statistics of diphtheria in Michigan, for the year 1888, it seems to be very plainly indicated, as is pointed out in the Annual Report of the State Board of Health for that year, "that if no restrictive measures had been taken in the 311 outbreaks, and the averages had remained the same as in the 34 outbreaks in which no restrictive measures were practiced, there would have been 4,821 cases and 740 deaths. Deducting from these the cases, 1,529, and the deaths, 324, which actually occurred, there is indicated a saving of 3,292 cases and 416 lives from diphtheria during the year 1888

*Dr. A. Caillé, Archives of Pardiatrics, Dec., 1889.

by *isolation and disinfection*. Had the measures of restriction been enforced in each of the 311 outbreaks, as it was in each of the 58 outbreaks, in which they *were* enforced, the number of cases would have been only 541, and the number of deaths 165. Deducting these from the number of cases (1,529) and deaths (324) that *did* occur in the 311 outbreaks, there is indicated as having occurred 988 cases and 159 deaths from diphtheria in 1888, which could have been prevented by thorough isolation and disinfection in all outbreaks."*

Do not these facts offer an incentive to renewed efforts on every hand? They certainly do, inasmuch as the experience of the year from which these data were taken, does not differ from that of other years, except that the results are more and more encouraging as information regarding methods of restriction becomes more general, through sanitary conventions and publications issued for the purpose of diffusing such information.

Scarlet fever has had a history similar to that of diphtheria. Its first outbreak in this country was in 1735; and, subsequently, it has invaded the remotest parts of our land. It is the most fatal of the so called eruptive fevers. At the time our State Board of Health was organized, practically no efforts had been made to restrict this disease; and, scarlet fever annually caused more deaths in Michigan than any other disease, with the single exception of consumption. This fact showed the necessity of active preventive means which were promptly instituted with the result of placing scarlet fever in the fifth place, instead of second, in the list of the most fatal diseases of Michigan. It being now preceded by consumption, diphtheria, pneumonia, and typhoid fever in the order named.

An analysis of the statistics of scarlet fever in Michigan during the three years ending December 31, 1888, shows that the methods pursued were very effective in restricting the disease and the saving of life.

During these three years the statistics plainly show that the health officers of Michigan, acting in connection with the State Board of Health, in carrying out the adopted methods of isolation and disinfection, prevented 7,851 cases of scarlet fever, and saved 523 lives; moreover, it will be found by pursuing still further the inquiry of the Vital Statistics of Michigan for the three years, 1886–1888, that in the matter of the two diseases under consideration, that the local health authorities of Michigan prevented 14,152 cases of sickness and 1,994 deaths by enforcing the measures recommended by the State Board of Health.

If within the few years that this work has been going on, results so important in the control of diphtheria and scarlet fever have been secured, may we not hope for the complete abolition, not only of these two diseases, but also of whooping-cough, measles and consumption? May we not look forward with assurance to the solution of many dark problems, in the domain of preventive medicine; problems, the solution of which, may yield sanitary science a future of usefulness and success which we cannot foresee?

In order that such a consummation shall be realized it is necessary to have a thoroughly organized sanitary system, such as is contemplated by the laws of this State. There should be an efficient local board of health in every township, village and city. These local boards should be composed of efficient, earnest men, including a good physician who shall act as health officer. They should be in frequent communication with the

*Report of the Michigan State Board of Health, 1889, p. 213.

State Board of Health, and be prepared to meet any emergency which may arise.

But no board of health can do everything; it needs the hearty support and coöperation of all citizens in carrying out the necessary sanitary regulations. In a general way each individual can do a great deal to help the authorities limit the spread of infectious diseases, by keeping his premises clean and in a good sanitary condition. This is unnecessary to urge upon an intelligent audience sufficiently interested in these matters to attend a sanitary convention, but the fact should be emphasized, that filth forms a favorable culture medium for the propagation of the germs of infectious diseases.

Another thing which I believe, if systematically practiced, would be the means of greatly restricting these two diseases, is the systematic inspection of school children. Scarlet fever and diphtheria are often so insidious in their onset, and so mild in character, that a child may be sick with one or the other of these and be able to be about, and spread the seeds of disease and death among its fellow beings. This is something I have several times known to occur. Teachers might be trained to detect the signs of these diseases; and school boards should arrange with competent, painstaking physicians to whom scholars with suspicious symptoms could be readily referred. All cases which, in the judgment of the physician, require watching, should be reported to the board of health. Some such arrangement as this, I am sure, would, in the present state of our sanitary work, result in the prevention of many cases of these two diseases.

The sanitary condition of the premises, and the inspection of school children, however, are only two of the many ways in which it will be necessary for us to exercise constant vigilance.

But when diphtheria or scarlet fever evades our watchfulness and seizes upon one of our children, what is to be done? The first thing to be done is to notify the health officer of your local board of health. If the health officer fully realizes the duties and responsibilities of his office, and, above all, if he knows by experience that public opinion in his jurisdiction will place no stumbling block in his way, he will promptly visit the place where the sick person is. He will place upon the house a notice so plain and conspicuous that he who runs may read of the danger lurking there. He will give to each neighbor a pamphlet telling how to restrict and prevent the particular disease in hand. And let me say, by the way, that the State Board of Health has prepared such a pamphlet on each of the infectious diseases for distribution throughout the State, and they may be had at any time of the local board of health or by addressing the Secretary of the State Board of Health at Lansing. I wish that every parent, every householder, and every school teacher in Michigan had a copy of each of these pamphlets. I wish they would read them carefully, re-read them thoughtfully, and place them away in some safe, convenient place for future reference.

Now when the public has been fully notified of the existence of diphtheria, scarlet fever, or some other dangerous disease, the patient must be further isolated by placing him in a remote room in the house, a room which should be large and well ventilated, and from which all unnecessary furniture, carpets, draperies, etc., have been previously removed. If the house is so small that such a room cannot be provided, it will be better for the patient, better for the attendants, better for the community, that

the patient be removed to some suitable building where isolation may be complete, quiet secured, and where thorough disinfection of the room, clothing, furniture, etc., can be finally carried out. No one except the attending physician and necessary nurses should be allowed to go near a patient sick with diphtheria or scarlet fever. On leaving the room where there is a case of either disease the physician should exercise great care lest he should convey the germs of the disease to another household. Nurses, who are constantly with the patient, will need to use much greater care than the doctor. They must, before mingling with others, effect a complete change in clothing and carefully bathe the hands, face and hair with some disinfectant wash. A very good material for this purpose is a solution of chlorinated soda, commonly known as Labaracque's solution. All discharges, from the nose and throat, should be received on old cloths, which should be burned at once, or put into vessels containing some strong disinfecting solution. The same is true of all other discharges from the patient. For this purpose, a solution of fresh chloride of lime, of the strength of four ounces of the lime to a gallon of soft water, may be used or, instead, a solution made of four ounces of the sulphate of zinc and two ounces of common salt to one gallon of water. All soiled towels, bed linen and other cloths used in the room, which are too good to be destroyed by burning, should be immersed for several hours in this zinc solution. It is better that they should be put in when the solution is boiling hot. All books and playthings which have been in a room with a child sick with any of these contagious diseases of childhood, can be properly and safely purified by fire alone. For want of knowledge of this fact, or for the willful neglect of it, in some houses which have had a visitation, many a poor child has forfeited its life and many another has suffered weeks of sickness. It is recommended, by high authority, that the room be kept filled with a disinfecting vapor, produced by keeping constantly simmering in the room a basin of water in which has been placed two tablespoonsfuls of a mixture composed of a fluid ounce of carbolic acid, a fluid ounce of oil of eucalyptus, and eight fluid ounces of spirits of turpentine. The odor of this vapor is somewhat pleasant, and, I believe, it is beneficial in rendering less active the virus of a contagious disease. In all cases of scarlet fever, it is important that the skin of the patient be anointed, with carbolized oil or carbolized vaseline; or, if the physician prefer that it be frequently sponged with some warm antiseptic wash, to the end that the contagion shall be less likely to be spread by the process of desquamation or scaling.

After the patient has so far recovered, that the services of the physician are no longer required, the health officer should again be notified. Convalescence may be so far advanced that the patient appears perfectly well, and yet he might be capable of conveying the disease to others. In cases of scarlet fever the period of contagiousness continues until the desquamation is completed, and until all discharge from a sore ear ceases, should there chance to be one.

It is believed by some that a patient suffering with scarlatinal dropsy may convey the contagion to another. At any rate, the period of infectivity in both diphtheria and scarlet fever, is of decidedly greater length than is popularly supposed; and, quarantine should not be abated until, in the judgment of the health officer, the convalescent may safely mingle with others.

In no case should a public funeral be held in a house where there is or has been a case of diphtheria or scarlet fever. If, unfortunately, a death

should occur from one of these diseases, the body should be wrapped in cloths saturated with the zinc solution mentioned above, but of twice the strength there given, and the burial should be conducted as early and as quietly as possible. Under no circumstances should a child attend such a funeral. After death or complete recovery, the entire premises should be disinfected, including the cellar, the attic, the pantry, the woodshed and the privy.

The most practical way to disinfect the room is by fumigating with burning surphur. Place all the contents of the room, which cannot be washed as above described, in such manner that the fumes may completely surround them and permeate them. Close the room tightly. Place a tub of water in the center of the room. Over the water set a kettle containing three pounds of sulphur for every one thousand cubic feet of air space to be fumigated, pour over the sulphur an ounce or two of alcohol, light the alcohol with a match and quickly leave the room closing the door tightly. The room should be subjected to fumigation for twenty-four hours, after which open the doors and windows and let the air blow through the room for three or four hours before entering it.

We sometimes find people who affect to believe that all these precautions are unnecessary; but, no one who has had experience with these diseases and has honestly tried to wipe them out, believes so. Others say it is unnecessary to have the local board of health supervise the isolation and disinfection of these cases—that the attending physician is capable of managing these things. As a rule the physician is capable, but, from experience as practitioner and health officer, I know that he very seldom will do these things. If we ever completely subdue the infectious diseases it must be done through the activity of local boards of health acting, as parts of a great system, with the State Board of Health as the executive center. Still others assert that these diseases are peculiar to childhood and it is better for the children to have them while young and have done with them. As Dr. Kedzie, a former member of the State Board of Health, once said: "If these are the diseases of childhood, in heaven's name why not throw special protection around children at this critical period, carry them by this time of danger, and in adult life permit them safely to defy these diseases, or with the vigor and strength of maturity withstand their assaults."

The discussion of the subject of "Scarlet Fever and Diphtheria," by A. C. MacKenzie, M. D., Negaunee, was not in manuscript form, and is not printed in the proceedings of the convention.

The address on "Typhoid Fever," by Arthur Hazlewood, M. D., member of the State Board of Health, Grand Rapids, was not in manuscript form; and, as since that time Doctor Hazlewood has been unable to reproduce it, the address is necessarily omitted from this publication.

Third Session, Friday, August 14, 2:30 P. M.

SEWERAGE AND DRAINAGE OF NEGAUNEE.

BY CHARLES F. ZUKOSKI, E. M., NEGAUNEE.

Mr. President, Ladies and Gentlemen:

In looking over the literature I was able to procure from the library of the State Board of Health, and other sources, on this grave and important subject, sewerage and drainage, I notice that some writers begin by giving an historical description of the question, others take up the subject by giving an account of the progress of sanitary engineering through the dry-earth closets, the pail or tub system, cemented vaults exterior to the house, the pneumatic system, and the present system of water-carriage sewers, all of which when undertaken by communities who attend to the affair in a scientific manner, reach the most wholesome results.

In attacking the subject for Negaunee, one is at once struck with the many peculiar conditions, both natural and artificial, which attach themselves to this problem. I will briefly name some of them and try to show their importance:—

1. This is strictly a mining city and consequently its career as a city depends solely and entirely upon its mineral resources which, from the present outlook, are not in any danger of being exhausted in a few years.

2. The inhabitants I will divide into two classes; namely:

(*a*) The permanent population.

(*b*) The floating population.

The permanent population comprises nearly all the business men and their families who will be found to occupy the central portion of the city, who are naturally anxious that the health of the citizens should be protected; and who understand the necessity, and are in favor of a good system of water supply and sewerage.

The floating population is made up of almost all nationalities, the most predominent being the English, Irish, Swedes, Danes, Finlanders, Italians, and a comparatively small number of Germans, French and Americans. This floating population, taken as a whole, is what we might call a roaming one, consequently they are not interested in the welfare of the city, and, therefore, any steps taken by the city which necessitates the expenditure of personal money for the ultimate benefit of the city, will be met with much opposition. Again, the wealth, or better said the income of this class, will hardly justify them to make public improvements, when they do not know how long they may retain their work or even remain in the city.

3. The natural difficulties which may be subdivided into five classes: (*a*) The great expanse of territory covered by the city; (*b*) the localization of groups of several hundred families into isolated communities, as Cornish Town, Pioneer, South Jackson, Cambria and Hartford locations, and others around the mines of the East Range; (*c*) the disposal of mine waters which are at all times more or less contaminated

with filth and dirt; (*d*) the outlet of a complete sewerage system and proper disposition of its contents; and (*e*) the extreme cold winters, necessitating the laying of sewer pipe deeper and thus reducing in many cases the effective hydrostatic pressure.

In 1887 that most august of bodies, the common council of Negaunee, realized the fact that something ought to be done pertaining to this grave problem, the sewerage of Negaunee. They even went so far as to engage the services of Chester B. Davis, hydraulic engineer, of Chicago, Illinois, to draw plans and prepare specifications for a system of sewerage, which would be adequate and cheapest for this city.

Accordingly, Mr. Davis made his surveys and calculations and sent an elaborate set of maps and profiles of all the streets and alleys, which in his estimation were necessary to give Negaunee a good sewerage. He adopted the seperate pipe system which is intended to carry off only the refuse from domestic use and not to carry the rain water from the surface. There is no doubt that the system is a good one, for the sandy soil provides a good drainage for the rain and melting snow water.

The grades of the proposed system are not steep enough to warrant the use of large pipes for carrying off both domestic sewage and rain water, and when said large pipe is only being used for domestic purposes, the flow will be so sluggish that a deposit will surely form on the bottom and sides of the pipe. Such deposits, which are usually composed of a fatty, half decomposed organic matter, would soon begin to ferment in favorable warm weather and breed millions of germs, and hence are dangerous.

Again Mr. Davis designed that the system of pipe should occasionally be flushed from Teal lake by having a pipe connected with the system. It is here I wish to bring up an argument and I hope that those present will take up this point for discussion. Will the water from Teal lake serve to flush the system effectively, or, as I think, will it simply flush the mains in a direct line from Teal lake to the outlet? The best way of flushing the system would be to have each terminal service pipe of six inches in diameter, connected with a pipe of the city water-works, and at stated intervals, say at night, have fresh water run into these sewer pipes and thereby flush the small pipes as well as the large ones.

The system planned by Mr. Davis is so arranged, that additional sections of the city can be easily attached, so the sewers can grow like a mighty tree and be death to all filth. The topography of the city is such, that the surface waters can readily find their outlet either into Teal lake or Partridge creek. That portion of Partridge creek which is located in the heart of the city, commencing at Cyr and Bluff streets of the Jackson addition, through Iron street and Pioneer avenue down by the furnace, ought to form one of the trunk sewers, for it is the ultimate fact that Partridge creek will be the outlet for any system of sewerage. It is therefore best to take up this water as soon as possible, in order to render the main business portion of the city dry and free from periodical floods.

I will conclude by calling the attention of the citizens of Negaunee, to that terrible nuisance commonly known as a cess-pool. When the soil allows the liquids to freely soak away, cess-pools and vaults are at a premium, and the fact is counted as an inducement to the locality.

Recent light thrown upon the purification of sewage in the soil, makes more apparent the evils of the process. It is known that the purification is largely the results of fermentation, or the life process of certain very

minute germs or organisms, which sweep away the filth with remarkable vigor and speed.

It is further known that these organisms are not usually found more than eighteen inches below the surface of the ground. The danger of pouring concentrated filth into the earth, as done through the vault and cess-pool system, thus becomes apparent.

In a great many places the saturation of the sub-soil with sewage, is so great, that the usefulness of the cess-pool has ceased. In looking over the city, one is astonished to see the utter disregard of sanitary laws in regard to the cess-pools and wells. There is not one cess-pool in Negaunee that is cemented and so constructed that it can be properly cleansed and disinfected. One is constantly met with an answer that sand will filter the dirtiest and most polluted waters, and the more ignorant of sanitation the person is who gives that answer, the more triumphantly he tells you; and they even become indignant that you should merely suspicion such a possibility, let alone a probability.

I will give the results of Professor Victor C. Vaughan, of the University of Michigan, who has made actual experiments on this important point.

He says: In order to ascertain to what extent soil was contaminated by privy vaults, he dug down near a privy vault which was situated on the outskirts of the town and isolated, so that there were no other known sources of contamination around. He dug down, (one foot away from this privy-vault, and took up some soil three feet below the surface to determine the amount of organic matter in it. Then he went off six feet and did the same thing, then twelve, then eighteen, then twenty-four and thirty feet, and without going into detail, suffice it to say, that the contamination of the soil from that single privy, built upon nearly level ground, could be plainly detected 50 feet from the vault. This was determined by comparing the amount of organic matter in these different samples of soil, with other soil of the same kind, where there were no known sources of contamination.

To impress upon you with what danger these cess-pools are threatening your city, I will give you an example which shows without doubt the peril of these cess-pools. I refer to the water source from pit No. 7 of the Jackson mines. This water is pumped from pit No. 7, and was, up to a year ago, considered very pure water. The water comes from a rock drift which runs in a northwesterly direction under the company house occupied at present by Mr. Thos. Pellow. In the drift there is much sand and near the shaft it is dammed up by a masonry wall, which assures us that the water cannot be contaminated from the mine. At the end of this drift and just under the house above referred to, the ground caved in, necessitating it to be filled up. You will certainly concede that there is a connection between this drift and the surface, and that very probably the entire contents of liquids from the cess-pool of the house percolate through the sand into the drift, are thence pumped up with the surface waters and there used by a large number of families. To think that at one time it was proposed to supply the city with this water, makes one shudder. The analysis made by Prof. Vaughan, shows that this beautiful, pure, crystal-like fluid is worse than Teal lake water and its contamination probably due to one cess-pool. This shows us what a cess-pool can do.

Go along the southern borders of Teal lake in the vicinity of the Cambria and Hartford locations and count the privies and filthy stables and

barns, and you will not wonder that Teal lake water is bad, even without the immense amount of filth and organic matter thrown therein by those slaughter houses in the early days of Negaunee.

It is absolutely necessary to close all wells and compel all citizens to use city water, which can at least be kept comparatively clean and its dangerous qualities known from judicious analyses and observations. Then let the city council pass an ordinance that every new cess-pool must be cemented and cleansed occasionally, and finally the abolition of all cesspools when the city sewerage comes to their respective localities.

The discussions of the subject of "Sewerage and Drainage of Negaunee," by Ira Clark, city engineer, Negaunee, and J. R. Thompson, Ishpeming, were not in manuscript form and can not be reproduced for this publication.

DISPOSAL OF WASTE AND EXCRETA IN NEGAUNEE.

BY C. F. COCHRAN, M. D., NEGAUNEE.

There is probably no subject that will be discussed during this convention that is of more vital importance to us than the disposal of waste and excreta. From the vast amount of literature that has been published by sanitarians all over the world, we are forced to realize that other cities besides Negaunee have to deal with this gigantic source of danger to the public health, and it is our duty, to be alive, to prevent the accumulation of excreta upon which the death dealing germs feed and in which they multiply, having this material as their starting point of destruction to the human family.

The fearful epidemic of typhoid fever of Plymouth, Penn., a few years ago, was traced to the excreta of one family where the disease existed. This one example is being repeated in different parts of our fair land every year. Dr. Joseph Von Fodor, of Buda Pesth, in a paper, gives us the results of his research, during a period between 1863 and 1877, on the influence of filthy yards on typhoid fever, as follows:

Deaths from typhoid fever per 100 houses when the *yard* was	1. Very clean	159
	2. Clean	186
	3. Dirty	206
	4. Very dirty	282

This one example to my mind is conclusive proof that we should dread the accumulation of waste material.

Negaunee will compare favorably with other cities of its size in regard to health; the natural lay of the land among these bold bluffs, its rough and rugged iron ribbed hills with its bracing atmosphere, all are conducive to health. But we must not feel that these natural advantages do away with the necessity for care in preserving from contamination these beneficent provisions of nature. The residents of the different cities of the Upper Peninsula are apt to rely too much upon the pure air, pure water and invigorating climate of this region, and thus to become lax in looking after these details pertaining to the public health which may, and sometimes do, neutralize these benefits.

In malarial districts, the necessities of the case are such that the greatest caution in the care of waste and exreta seems imperative, and to a great extent the same is true in our own city, for a disregard of proper precautions in these particulars is sure to lead up to disastrous results.

To illustrate what is meant by a disregard of needful precautions, let us recall a picture of every day life in our midst. No one will, I trust, think his premises are especially referred to, as I do not wish to be personal, but anyone, doubtless, can readily make the application to some one or more of his immediate neighbors. Here by the back door is an open cess-pool, just far enough from the steps to be handy to the kitchen, in which to throw all the slops, wash water, small pieces of vegetables and an occasional bone with meat on it that a neighbor's dog is expected to carry away; the dog, however, will not touch it as it is covered up in that soapy, greasy, bad-smelling, slate colored water, and is made worse every day by the hot sun and exposure to the air. Nature's scavanger, the fly, is doing all he can to remedy the evil by coming in swarms to carry away these poisonous germs.

Last, but not least, there is a vault made of plank nearly full in a leaky and dilapidated condition; the ground has become saturated with this filth, and in case there is a well on the premises the poison from this source easily finds its way into it through the porous ground. This danger is especially noticeable by the honey-comb condition of some of the lots in the older part of the city. This poisoned water is a fruitful source of disease, and we must not shut our eyes to the danger growing out of these evils. The system may repel the poison for a time, but the ultimate result of the use of such water is not pleasant to contemplate.

If our present system for the disposal of this material is not to be superseded by the sewerage system, which I believe to be the only satisfactory method of its disposal and the one which the people will demand at no distant date, it is of the greatest importance to us that every precaution be taken to reduce the danger of the present system to a minimum. While the present system remains, I would have the city have full charge of all of this accumulated filth, and levy a tax, if need be, on the householder; require shallow vaults on the plan of the dry-earth closet so as to have easy access to them by a paid scavanger, whose duty it should be to keep them emptied, and make any neglect on his part the subject of a report to the proper authorities. The material to use with this system is dry earth, but if this cannot be had, ashes will answer the purpose, and are always convenient; this would reduce the danger of disease from this source to the minimum, as there is absolutely no smell from the deposit when it is thoroughly covered by either of these materials. There might be a revenue derived also by the sale to farmers during the season of this substance for a fertilizer. Halifax and other cities have tried this, with modifications to suit the different localities, and the death rate has been reduced, and this method thereby proven successful.

We see, in our tour of inspection, potato peelings, egg shells, scraps of all kinds from the table too numerous to mention scattered about, which should never be allowed to accumulate; they shonld be burned in the kitchen stove after each meal. This simple way of disposing of this waste material will prove very satisfactory and answer the same purpose as that secured by the more elaborate garbage furnaces in use in larger cities.

The alleys of this city are too often considered as private property, and used to dump all manner of slops and garbage. This is wrong, and a hearty coöperation with the authorities in keeping the alleys as clean as the streets, of which they are a part (being subject to like control by the city), would prevent many cases of sickness and death.

I cannot urge too strongly those who have to use our nuisance ground that they bury underground all vegetable and animal matter taken there; nor can I find language adequate to express the horrible stench and reeking filth which that three-acre lot has given rise to in the past; and it is not a matter of wonder to me that the residents in that part of the city still claim that it is too close to them for comfort. This ground will continue to be a source of danger till everyone is willing or compelled to cover up the refuse there deposited.

The Smead dry closet is working successfully in our Case street public school, and our school board have reason to be thankful that they so effectually dispose of the excreta of 700 pupils.

The sewerage system, to my mind, is the one great panacea which must be applied to lessen, if not to cure, the crying evils that threaten us at the present time.

Do not think I had forgotten or even recommended the open sewer coursing down through Iron street which some have been allowed to adopt and thus pollute this stream in the heart of Negaunee, from which hundreds are exposed to danger every day. My faith in this convention is, that it will be helpful in awakening a lively interest in these subjects relating to the public health, and that the day will be hastened when these sources of danger will be wiped out, with many others that have been mentioned; and that, as a result, Negaunee will stand among the first in a sanitary point of view of all the cities of the Upper Peninsula. But time will not permit further details.

Many others might easily be mentioned and much of a general character could profitably be said on this topic. I have only touched upon a few of the more obvious matters in connection with the disposal of waste and exereta, and if what I have so imperfectly said shall furnish some food for thought and lead up to a fuller discussion my purpose will have been accomplished.

The discussion of the subject of the "Disposal of Waste and Excreta," by Prof. Delos Fall, M. S., member of the State Board of Health, was not in manuscript form; and, as Prof. Fall was unable to reproduce his remarks, they are omitted from the printed proceedings.

SCHOOL HYGIENE.

BY PROF. F. D. DAVIS, SUPERINTENDENT OF SCHOOLS, NEGAUNEE.

When the secretary of this convention informed me a few weeks ago, that I was expected to read a paper before this assembly, I was somewhat surprised but gave the matter no farther thought until I read in a local paper that I had accepted the invitation. When I saw that all the arrangements had been completed, the invitation, the acceptance, etc., without any assistance on my part, I began looking around for suitable material for a paper upon the subject of School Hygiene. I had succeeded in collecting sufficient matter for this exercise when I received among other things from the health department of this State some half-dozen articles upon this same subject, read by able writers at former conventions of this kind. Some of these I read, enough indeed to learn that all my *original matter* and many points that had not occurred to me had been thoroughly discussed before. So, I can not better preface these remarks

than by a short quotation from America's greatest poet, whose remains are deposited this day in their final resting place:

"Though old the thought and oft exprest,
'Tis his at last who says it best,—
I'll try my fortune with the rest."

In these days we hear a great deal about "high pressure" and stringent requirements in school work. The frequent failure of the health of pupils in public schools, especially in the higher grades, has been a matter of common observation and remark. It certainly is true, and the statement will hardly be questioned, that the average health of pupils in the higher departments is not up to that of former years. In our own schools a large number, principally in the High School, drop out each year unable on account of impaired health to complete the course.

Nevertheless during my ten years experience as teacher, I have never known a single case of failure of health, which I believed was caused alone by overstudy; and I farther believe that such a thing would be unheard-of, if the work were done under proper conditions, and if sufficient attention were given to the laws of hygiene during the balance of the 24 hours each day.

Mental work instead of being unhealthful is extremely healthful employment as is shown by the lives of hundreds who have devoted themselves exclusively to intellectual pursuits. As an illustration of this look at the lives of such men as Gladstone, Bismark, Blaine, Bancroft, Longfellow and Lowell. At three score and ten, the time commonly allotted to man, these were in their prime of manly vigor and strength.

Oliver Wendell Holmes, upon being asked when and where one should begin with the education of a child replied, "you should begin with his grandfather."

Henry Ward Beecher is accredited with no more profound saying than the solecism, that "the first requisite to secure health and long life is to be particular in the selection of one's parents"; and yet this is only another way of stating the thought from holy writ, that "the sins of the parents are visited upon the children to the third and fourth generation." Without doubt, many children inherit weak constitutions and tendencies to certain kinds of disease.

Every year adds to the grand sum of the world's knowledge, and every age requires more of the successful man and woman. In the race of life today one needs better intellectual qualifications than a generation ago, and the child of today must keep pace with this growing demand if he would not be outstripped by all his competitors.

Under suitable conditions and with healthful surroundings, there is no reason why any boy or girl with an average amount of vitality should not be able to complete the ten or twelve years' work required in the public schools with ease and with unimpaired health; and simply because there are occasional cases of impaired health during school life, it is unfair and untrue to charge these to "high pressure" or overwork.

If boys are allowed, as scores in Negaunee are, to spend their evenings upon the streets and in more questionable places until ten, eleven, or even twelve o'clock, consuming that vilest of combinations, the American cigarette, is it at all strange if the minds of some of them become weak and unable to stand the strain of school work? If girls from fourteen to eighteen years of age are permitted to attend the evening party, exhausting strength and vitality in the social dance until twelve, one, or two

o'clock in the morning, can we reasonably expect them to recover sufficiently from such dissipation to undergo vigorous mental work the next day or even within a week?

Sleeping apartments occupied by two, three, and sometimes four children, in which no attention is paid to ventilation, is one of the chief causes of impaired health. Sound, restful sleep is an imperative necessity to a growing, active mind, and is possible only with an abundant supply of good air.

Add to these conditions the lack of proper and sufficient care for the feet and body and you have many of the causes of the breaking down of the health of pupils.

Unhygienic conditions in the school room are the insidious but no less real causes of many disorders that pupils are subject to, such as headaches, nervous diseases, and impaired vision. These diseases arise from inadequate or excessive heating, improper lighting, want of exercise, and deficient ventilation.

The number of children to be found who must resort to the use of glasses is astonishingly large and apparently on the increase.

Much of this is, no doubt, caused by school rooms being so arranged that pupils face the light; or what is worse, there are windows on opposite sides of the room, thus subjecting the eyes of pupils to cross rays of light. No school room should have windows on more than two sides and the seats should be so arranged that the light falls over the shoulder and not into the eyes of pupils.

I am pleased to be able to say that the Case Street school building is admirably arranged in this respect. In all the others of this city a marked improvement could be made.

But most important of all and the most difficult to obtain is the satisfactory ventilation of the school room. If there is truth in the "germ theory" of disease, a large share of all contagious diseases is transmitted through the medium of the air. The air in some of our school rooms after being occupied an hour is sickening in the extreme. The effect upon the pupils is a sense of dullness, drowsiness, headache, nervousness, and general tiredness of the whole system.

I have frequently heard the remark made, that "there is no danger but pupils here will get fresh air enough." On the contrary the colder the country the tighter and warmer must all buildings be constructed, and the greater the need of ventilation.

The average school room is about 30x32 ft. and about 14 ft. high, containing 13,440 cu. ft. of air, or enough to last 50 pupils about 15 minutes. Each room should have a fresh-air-inlet duct with an area of not less than 40 sq. in. But this alone will not ventilate the room, even if it is placed under a radiator or near a stove. You cannot pour water into a bottle already full, nor will fresh air pass into a room until some of that already there is withdrawn to give it a place. The outlet for foul air into the chimney or ventilating stack should be the same size as the inlet or larger. But this is not enough. Both these will not ventilate the room.

The most perfect system of ventilation is the large open fire-place of our grandfathers; but this does not apply to the modern grate, which is chiefly an ornament, a thing of beauty, in which is built only on occasional fire. A grate without a fire, or a flue in a brick wall is little better than nothing at all. The draft will be up or down according as the air without is lighter or heavier than the air within, and when it is the same there will be no

draft at all. Many find it necessary to close up the grates entirely in their houses on account of the cold down draft in winter time.

If you take a bottle filled with dirty water, submerge it in a pail of clear water or drop it into the lake, and then remove the cork, to see how long it will take for the impure water in the bottle to be purified, you form some idea how long it will take to ventilate a room through a cold chimney.

Since air has a pressure of sixteen pounds to the equare inch, it is not reasonable to expect it to circulate up a chimney without a propelling force. If it should do this, the earth would soon be without this life-giving compound, as it would float off through space and all animal life here would soon become extinct.

If you remove the foul air, you can rely upon its place being filled by air from cracks in the wall and around doors and windows, and thus have fair ventilation, but an inlet without an outlet signifies nothing.

The only satisfactory method of producing this current is by heating the air in the outlet or ventilating stack; and sufficient heat cannot be transmitted from a stove or furnace pipe through a four or an eight inch brick chimney to produce a current strong enough to supply fresh air for an ordinary school room.

Nor can the construction of those flues always be left to an architect, as is shown by the experience of teachers and pupils of the Case street school building.

Thus we see that the only absolutely essential part of a ventilating system is to have a ventilating flue large enough to carry off the foul air with sufficient rapidity, running from each room to the top of the building, in which the air is thoroughly heated to produce a current. The only extra expense in constructing a building, to have it properly ventilated, is the cost of brick and labor to build a little larger chimney and to place an iron smoke stack in the center and sheet iron partitions for the ventilating flues. In a one-room school building, of which we have three, or in an ordinary dwelling house the extra cost should not be more than $25.00.

I hope the time will soon come when it shall be one of the health officer's chief duties to inspect all churches, school rooms, halls, and other public buildings, and insist upon adequate ventilation; and when in the construction of private houses as much attention will be given to this as is now paid to heating and lighting. When some of these things receive more attention there will be little occasion for complaint of the "high pressure" and the stringency in our schools.

The discussion of the subject of "School Hygiene" by Rev. Dr. Hurd, President of Carlinsville University, Illinois, was extemporaneous and cannot be here reproduced.

Rev. Frederick Strong addressed the convention on "Public Health a Public Duty"; but as his remarks were extemporaneous and he has been unable to reproduce them, they are omitted from this publication.

Fourth Session—Friday, August 14, 7:30 P. M.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES FROM THE STANDPOINT OF A MINISTER.

BY REV. CHARLES M. BROWN, NEGAUNEE.

I have been requested to speak concerning the restriction and prevention of the dangerous and communicable deseases as viewed from the position of a clergyman. I interpret this to mean what can the clergy do to prevent the spreading of dangerous and communicable diseases. I am of the belief that his power is limited. He possesses no authority, he commands no officers. He can influence, and instruct, and advise, but further he cannot go. The mission of the church is to benefit and elevate mankind. All then that tends to such an end is clearly in the province of the clergy. It is not merely the cry "come to Jesus" that will give a reconstructed manhood. Before that cry is heard there is a formative work. Men must be prepared to come. They must feel the need of the spiritual cleansing. How can they possess that lofty craving if they are surrounded by conditions foreign to its attainment?

These conditions then must be removed. The environment that is the harbinger of disease must be purified. The church must have a care for the bodily health, as well as for mental and moral culture. The cry is "how to reach the masses;" how to get hold of this great mass of non-Christians. The fact is that a great majority of that class is a mass—of filth and disease. The church cannot touch them in that condition. General Booth of the Salvation Army has hit the nail a monstrous blow in his "Darkest England." Remove the people from their filthy surroundings. Teach them that soap is an article for external application, not of diet. That the lungs work with greater freedom and more success when they are free from contaminating atmosphere. That sewers are not built to give employment, expend money and increase taxation, but that they are health-giving streams. Educate the people. Compel them, if needs be, to obey and respect enacted hygienic laws. With such conditions the question of the masses would, to a large degree, be solved. Disease would be quarantined. Spiritual truth would find more ready access. Hence a better state of physical and spiritual health to all mankind.

The clergy should teach the relation between the physical, the mental and the spiritual.

A prominent clergyman upon being asked what one element contributed most to the success of a successful minister, replied, "a good stomach." And there is a volume in that sentence. There are certain constituted laws of health that must be obeyed if one would be healthy. Their teachings must be heeded if one would be a success. It matters not whether one be engaged in the ministry, the counter, the desk, or the bench. The laws are the same. A disregarding of them produces like results.

A dyspeptic stomach produces a dyspeptic mind. A disordered spleen is the forerunner of a disordered mind.

Get the mind out of order or twisted by the crank of disease and you have touched the button that fires the blast.

Who then knows what will be to pay. The inspired word says "that the fathers have eaten sour grapes and the children's teeth are set on edge." Also, "that the sins of the fathers shall be visited upon the children unto the third and fourth generation." It then becomes the duty of the clergy to teach that violation of physical law is a sin that is visited with disastrous and continued results.

Moreover, the clergyman is to speak against a false public sentiment. A man cannot be buried decently now-a-days, unless the largest auditorium be filled at his funeral and he be followed to the grave by a procession a half mile in length.. I have seen them stand about that grave, with uncovered heads, and the thermometer 20° below zero. I have been driven 12 miles, at a slow walk, with the thermometer in the neighborhood of the twenties, for sentiment's sake, and for sentiment's sake I have been sick in bed. All respect to the dead, but it seems to me that the living are entitled to more consideration than those past bodily harm. To have that thought for the living, public sentiment must be transformed.

I was in a city recently and was told that there were 600 cases of scarlet fever. I did not wonder at it when, in a few hours afterward, I passed by a house where a scarlet fever patient had died, and I saw both house and yard full of sympathetic friends attending the funeral—and may I add, gathering the germs of that deadly disease to carry about the city.

It may seem hard,—*it is hard*, to remain away from the home of an afflicted friend; but it would be harder if, in going on mercy's mission, we propagated death's messenger.

Self sacrifice must be practiced, both by the afflicted home and the sympathic friend, lest rushing forward to aid we become messengers of death.

A word now and I am through. I believe that wise and thoroughly interested men have planned our sanitary laws. Those laws are the best possible restriction and guides. It then becomes every citizens' duty to inspire confidence in and submission to them. To this end may we all, clergymen and laymen, labor, and may we throw an impregnable barrier around those dreadful and death-bearing diseases.

The remarks on the "Water Supply of Negaunee," by Hon. John Avery, M. D., president of the State Board of Health, Greenville, were extemporaneous, and cannot be reproduced in this printed proceedings; but the recommendations by the State Board of Health, relative to the source of water supply of Negaunee which were read by Dr. Avery, in the course of his remarks, are as follows:

RECOMMENDATIONS BY THE STATE BOARD OF HEALTH.

Read by Dr. Avery, President of the Board, in connection with his remarks to the sanitary convention, Negaunee, Mich., August 14, 1891.

In the judgment of the State Board of Health, it seems desirable that a source of water supply, less liable to contamination than Teal lake, should be found; but, if it should prove impracticable to obtain water from a better source, and water must still be taken from the lake, we would respectfully recommend:

1. That all slaughter houses, and similar establishments, be removed to a point where the drainage will be away from the lake.
2. That the lake be no longer used for the storage of saw logs, or for the deposit of refuse from mills.

3. That an intercepting sewer be constructed along the south and east shores of the lake, and all residences on that water-shed be connected therewith.

4. That, if found practicable, all water from the mines shall be disposed of through this intercepting sewer; if this is not practicable, that it be disposed of by other means than by being pumped into the lake.

5. That no rubbish, refuse, or filth of any kind be allowed to be deposited any where upon the shores of the lake.

The discussion of the subject "Typhoid Fever," by H. W. Sheldon, M. D., Negaunee, which was postponed from the second session, was not in manuscript form, and can not be here reproduced.

The address on "Restriction and Prevention of the Dangerous Communicable diseases From the Stand Point of a Physician," by Oscar Dodd, M. D., Negaunee, was not in manuscript form, and Dr Dodd was unable to reproduce his remarks for publication.

THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES,

FROM THE STAND-POINT OF THE STATE BOARD OF HEALTH.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICHIGAN.

From the stand-point of the State Board of Health, the topic discussed this evening, "Restriction and Prevention of the Dangerous Communicable Diseases," includes the most important subjects which can come before a sanitary convention; it includes the most important subjects which can be considered by boards of health, by health officers, and by all who are endeavoring to lessen the ravages of preventable diseases; it includes the most important subjects which can be considered by the most enlightened statesmen, by the most conscientious legislator, and by the intelligent householder who values the life and health of those most dear to him. A very important and immediately practical work of the State Board of Health is for the restriction and prevention of the dangerous communicaable diseases. It will be well if the people generally shall come to understand that the most important work of the local board of health and of the local health officer is for the restriction and prevention of the dangerous communicable diseases. The common but false idea that the local health officer is to act only for the abatement of nuisances, is responsible for the permitting of many deaths from the dangerous communicable diseases beside which all ordinary nuisances sink into comparative insignificance. It will be well if the people shall come to understand that the most dangerous of the communicable diseases are not caused by ordinary nuisances. Every intelligent person should be informed as to the causes and methods of spreading of each of the dangerous communicable diseases. Such knowledge is of more practical importance than much that is taught in the schools, discussed in public, or in private conversation, or dealt with in books and newspapers.

In the brief time at my disposal for this discussion, if I can impress upon this audience a clear idea of how immensely important this topic is which you have placed upon the program, probably I could not do better; because when people once come to realize the importance of these subjects their self interests will certainly lead them to investigate further, and they will then gain that sort of knowledge which Herbert Spencer, in that

wonderful book of his on "Education," has designated as that knowledge of "most worth"; namely, that knowledge which tends directly toward the preservation of life. It is the lack of such knowledge among the people generally, that causes so many among us to "die as the fool dieth." It is true now, as when the book of Hosea in the Bible was written, that "My people are destroyed for lack of knowledge."* But we are gaining every year more and more of that knowledge which is able to make us wise unto the salvation of human life, and sanitarians are, today, able and willing to tell us how to restrict and to prevent all of the most important causes of death in Michigan. Let us see what those diseases are.

The law makes it the duty of the State Board of Health, and accordingly it has been its custom, to study and make practical use of the vital statistics of this state, now collected and compiled under the direction of the Secretary of State. I have here a diagram which has resulted from a study of the deaths reported to have occurred in Michigan from the dangerous communicable diseases during the twelve years, 1876-87.† Since this diagram was made, one more disease, pneumonia, has come to be accepted by sanitarians as communicable. If pneumonia were inserted in its proper place, it would appear below diphtheria and above typhoid fever; and then the first five diseases named in the diagram would be the five diseases which caused the most deaths in Michigan during those twelve years. Now, if you once grasp the idea which the facts thus condensed teach, you will begin to realize the vast importance of the restriction and prevention of the dangerous communicable diseases. I beg you to consider that the five diseases which cause most deaths in Michigan are dangerous communicable diseases, that they are all preventable diseases—that is to say, they are all diseases which can be restricted and prevented, and we already know how.

In the few minutes allotted to me to speak on this topic, you will hardly expect me to tell you all that the State Board of Health knows, or even all that I myself know about the restriction and prevention of the dangerous diseases, but I may briefly mention a few of the salient points in the measures which the State Board of Health recommend. The Board prints and distributes pamphlets telling how to restrict and prevent each of these most important diseases; and, in one little leaflet, has summarized the most important recommendations, which I here still further condense:—

1. The most important measure for the restriction of consumption, is the disinfection or destruction of the sputa of every consumptive person.

2. The chief measures for the restriction of diphtheria are the complete isolation of every infected person and thing, and, after death or recovery, their thorough disinfection.

3. The restriction and prevention of pneumonia require the disinfection of all sputa, special care relative to ventilation, and relative to exposure to cold.

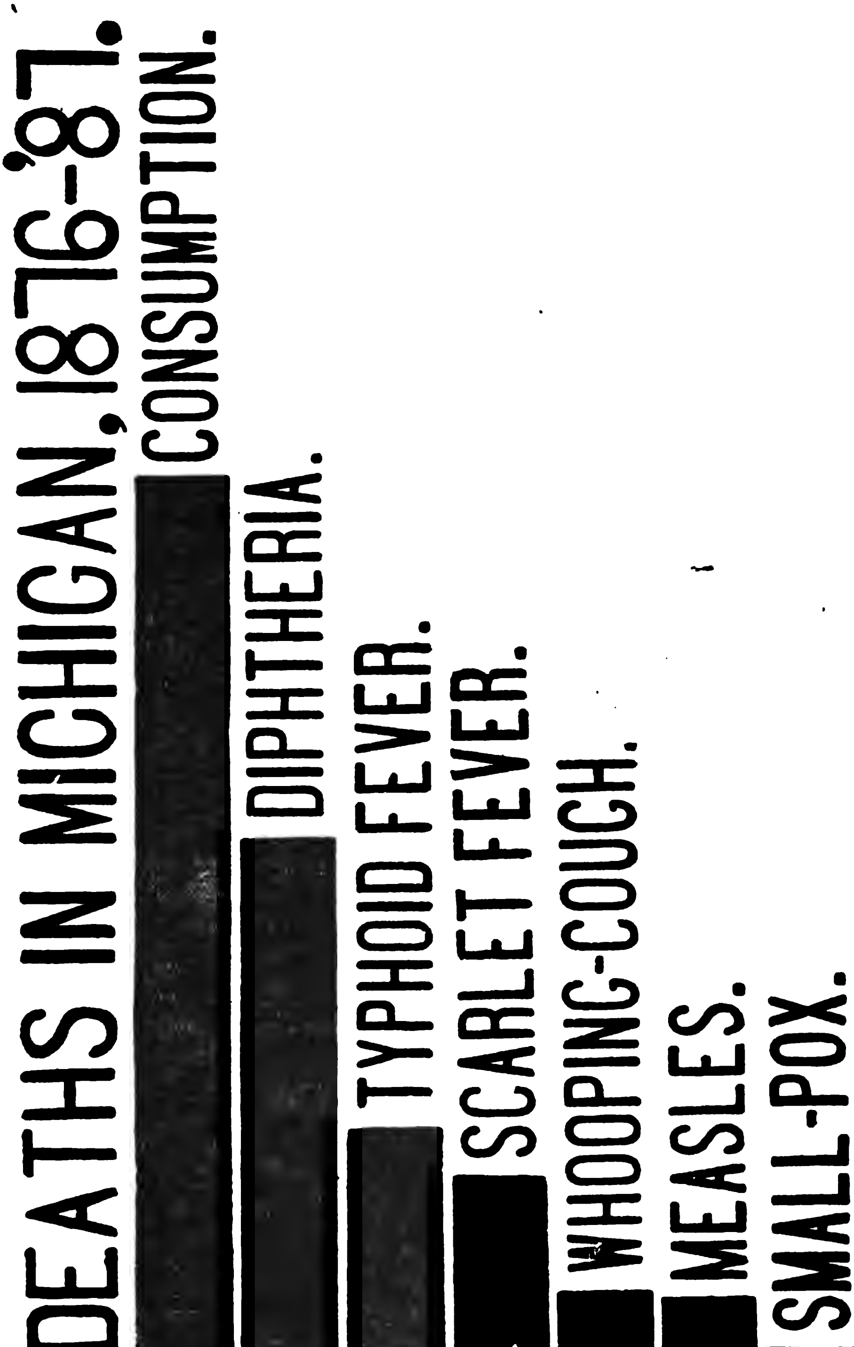
4. The restriction and prevention of typhoid fever calls for the disinfection of all infected excreta, care relative to all excreta, preservation of the purity of the drinking water, and the boiling of all suspected water for household use.

5. The restriction and prevention of scarlet fever is accomplished by the absolute isolation of all infected persons and things until after complete disinfection.

*Hosea, chapter iv., verse 6.
†Second page following this.

6. The rules for scarlet fever are applicable for the restriction and prevention of whooping-cough and measles, and also for small-pox; but for small-pox we have in vaccination and re-vaccination well-known preventive measures which should be so thoroughly employed by every person that restrictive measures would be unnecessary.

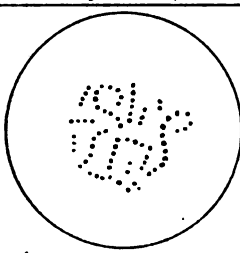
Let us all join in the effort to let the light so shine on this subject that we shall soon reach that "good time coming" when the five dangerous communicable diseases which now cause the most deaths in Michigan shall all have been restricted and in great part prevented.



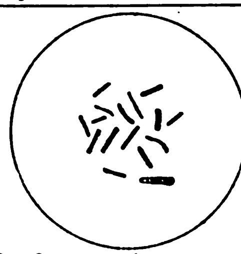
This diagram is accurately drawn to a scale, and the *relative importance* of each disease, as a cause of deaths in Michigan, is, therefore, correctly shown.

All the diseases mentioned above are believed to be caused by micro-organisms, some of which have been discovered, and drawings of them are exhibited on the next page.

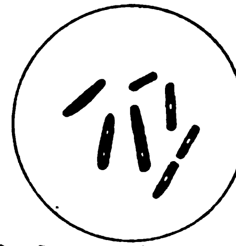
VARIOUS FORMS OF BACTERIA SUPPOSED TO CAUSE DISEASES.
(Copied from Dr. Carl Friedlænder's "Manual of Microscopical Technology.")
In Figures 1 to 9 magnified 1000 diameters.
In Figure 10 magnified 600 diameters.



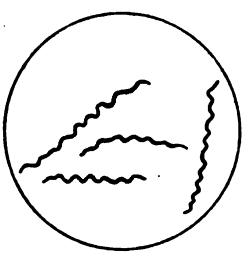
1. Pyæmia. Micrococci from pus.



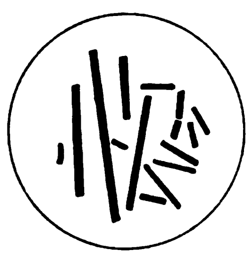
2. Consumption. Bacilli from miliary tubercle. One contains Spores.



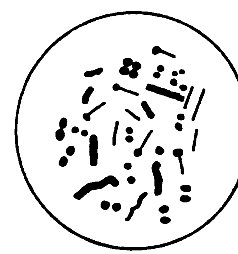
3. Typhoid fever. Bacilli from Peyer's patch. All contain Spores.



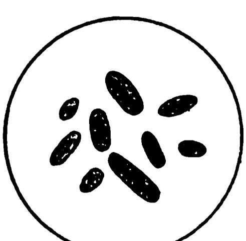
4. Relapsing Fever. Spirilla from the blood.



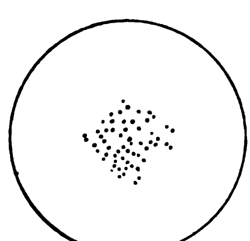
5. Anthrax (Malignant pustule). Bacilli from the blood.



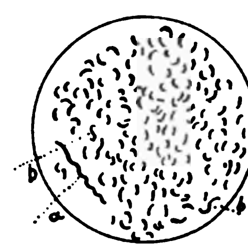
6. Various forms of bacteria found in the Saliva.



8. Pneumonia. Capsulated micrococci.



9. Erysipelas. Micrococci from the skin.



10. Asiatic Cholera. Comma-bacilli, [a] Joined to form threads; [b] The S-shaped forms.

Prepared to illustrate "History of investigations Concerning Micro-Organisms." By Mr. Frank Wells.

HOW MUCH OUGHT NEGAUNEE TO PAY ITS HEALTH OFFICER?

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICHIGAN.

I presume that the reason why each city is required by law to have a health officer, is that sentiments of common humanity dictate that proper effort shall be made, constantly, by the officers of every locality, for the best possible protection of human life and health within their jurisdiction.

But in this paper I propose to go a step further, and to point out the fact that this high humanitarian position which the law contemplates, when it requires cities to guard the health of their inhabitants, and to contribute facts and statistics for the general welfare of the people of the state, that all this, from a financial stand-point, pays the people of each city, and of each locality. I propose to speak especially of the city of Negaunee, but the same principle which applies to Negaunee, is applicable to other cities and localities.

Let us estimate the population of Negaunee as about six thousand, and that the death-rate in Negaunee is about the same as it has been in other parts of Michigan where it was not specially influenced, say about seventeen per thousand inhabitants per year. Then, the average number of deaths in Negaunee per year would be about one hundred and two. Of this number, a little less than twelve per cent would be from consumption, six and a half per cent from diphtheria, two and seven-tenths per cent from scarlet fever, and three and two-tenths from typhoid fever. These are all communicable diseases, and they are preventable through measures which are now known to health authorities.

Reliable statistics, collected by the Michigan State Board of Health, have proved that (even after the disease is introduced) about seventy-five or eighty per cent of the deaths from diphtheria and from scarlet fever are prevented if complete isolation of all infected persons is enforced, and there is then thorough disinfection of all infected substances.

I believe that there is a similar saving of lives from loss by typhoid fever, where the proper local health measures are enforced. Relative to typhoid fever, these measures are not so completely dependent upon efficient services by a health officer as are those relative to diphtheria and scarlet fever, yet they will not be likely to be effective except such services are maintained.

It is possible, then, through and in connection with the services of an efficient health officer, to save, in a city the size of Negaunee, in each year, the lives of about five persons from death by diphtheria, about two persons from death by scarlet fever, and, I think, about two persons from death by typhoid fever. In some years they might be more, and in some years, less; but these are the average figures per year, for a series of years. Surely the saving of these lives, and of the sickness of the still larger number of persons, is well worthy the effort of the city in compliance with State laws. But I wish to point out the fact that in saving those lives, and in the lessening of sickness, there is saved to the city that which has cost money, and that which if lost, would have been a loss in money values far in excess of the cost of any effort which the city puts forth in

sustaining an efficient health service. It costs money to raise up children to the age when they become producers of wealth. If children are permitted to die of communicable and preventable diseases, there is a great waste not only in life, health and happiness, but also in money. Statisticians have computed the average value of an adult person, for what that person will earn in excess of cost of maintenance, as about one thousand dollars. Practically about the same conclusion was reached by those, in the south, who some years ago bought and sold slaves, a good one selling for about eight hundred dollars.

If, now, we consider that the seven persons in Negaunee in each average year, whose lives should be saved from diphtheria and scarlet fever, are each worth five hundred dollars, there is in each year a saving of three thousand five hundred dollars from those two diseases alone. If two lives are saved from typhoid fever, by disinfection of infected matters, and by other methods which a good health officer could teach, the persons saved from that disease would ordinarily be in the prime of life, and this saving should be counted as two thousand dollars.

There is, then, a probable saving of five thousand five hundred dollars a year in Negaunee, by such work as can be and should be done by and in connection with the services of an efficient health officer, and this with reference to only three of the dangerous communicable diseases. Of course, I believe that lives can be saved from other diseases than those in which I have just computed the saving, but I have omitted most of them because not needed in my argument, and I have selected the three which I mentioned, because in diphtheria and scarlet fever we have the absolute proof that lives can be saved by measures that are well known to us, and in typhoid fever it has been proved beyond question that the disease can be almost entirely prevented by other measures which are equally well known.

In this brief statement of facts I have omitted all consideration of the costs incident to sickness, including physicians' compensation, medicines, nurses, loss of time, etc., also the cost for funerals, and have confined myself rigidly to the money losses through the actual deaths from three diseases. Without the efforts which I have supposed to be put forth by an efficient local health service, there is a money loss in a city the size of Negaunee, through the actual deaths from those three diseases, equal to five thousand five hundred dollars per year. Is it not better and really more economical to pay five thousand five hundred dollars per year for public health service than to bury that which is equal to that amount in money value, in the graveyard?

I am ready to admit that this counting of the cost of the life blood of your neighbor and perhaps of yourself; of your neighbor's child, perhaps of your own child, is to me exceedingly repugnant; but so long as your neighbor's life and your own, the lives of your neighbor's children and of your own are not properly guarded, but are permitted to be endangered from these same diseases that I have mentioned, it is plain that some other argument than the usual one, must be presented.

Undoubtedly public-health work in cities is neglected because of lack of information as to *how much* effort should properly be expended. Such computations as those I have put before you, should help us to arrive at conclusions on this point.

We will admit, if you please, that when deaths occur, the loss is not equally distributed among the people of the city; generally the loss falls most heavily upon the bereaved family, and this is especially true if the

death is of the bread-winner of the family. But it should not require much argument to show that the prosperity of a city depends greatly upon its healthfulness and the safety of life therein, and that, in a long series of years, the deaths are distributed somewhat equally among the people, and that, even if they are not equally distributed, a high moral sentiment should prompt us to guard the common safety of life among us. It was recognized even before the Declaration of Independence, that to each citizen the right to exist, the life of the individual is among the inalienable rights to secure which "governments are instituted among men." It is plain, therefore, that one of the highest, perhaps the very highest function of government is to guard the lives of the people.

Having reference, then, to only three important diseases, it seems plain that a city the size of Negaunee has the undoubted right to expend in every year at least $5,500 for the restriction and prevention of diphtheria, scarlet fever and typhoid fever. I think that there is good reason to believe that the citizens of Negaunee would make money by this work; because they would incidentally save lives and cases of sickness from other diseases than those I have mentioned; and, besides, in my account of the losses by those three diseases, I accounted only for the losses by reason of the deaths, leaving out of the account all the great expenses for the sickness. For instance, from the two diseases, diphtheria and scarlet fever alone, an efficient health service, properly supported, should in each year save all the expenses incident to 43 cases of dangerous sickness.* All such saving would be a clear profit, in case the city expend the $5,500 per year, as previously suggested, and save $5,500 worth of lives, as I have shown may reasonably be expected.

I would advise that at least $1,000 per year should be expended toward securing a water-supply which is above suspicion. This with special reference to the prevention of typhoid fever. I would use another $1,000 per year toward securing good sewerage, and a proper disposal of waste. Five hundred dollars would pay for disinfectants, for printing annual and other reports of sanitary officials, including the water and sewerage commissioners, and for other incidental expenses. This would leave $2,000 per year with which to pay the salary and expenditures of the health officer.

The law now requires much more of the health officer than it formerly did; and it provides fines and imprisonment for neglect of duties connected with dangerous diseases. If the health officer attends to such diseases he must lose his ordinary practice. Accordingly his compensation should be greater than formerly; it should be greater than he could obtain for the same time by the regular practice of his profession as a physician,—the life and health interests of the whole people of a city are of more consequence than those of the patrons of any single physician, no matter how large and lucrative his practice may be. But there is another still more important consideration. No reputable physician claims to *cure* any real specific disease such as diphtheria, scarlet fever, or typhoid fever. After a person has contracted the disease, it is important to have a skillful physician to watch and guard the patient as thoroughly as possible through

* The reports, compiled by the Michigan State Board of Health, show that for each death from scarlet fever there are over ten cases of sickness from that disease; that for each death from diphtheria there are four cases of sickness from diphtheria. Therefore the seven deaths on an average yearly from diphtheria in the average place the size of Negaunee should represent 28 cases of sickness, and the three deaths from scarlet fever represent 30 cases of scarlet fever, 58 cases from the two diseases; and, inasmuch as 75 per cent of them should be prevented by an efficient health service, 43 of the cases should not occur.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

IRON MOUNTAIN, MICHIGAN,

OCTOBER 30 AND 31, 1891.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF IRON MOUNTAIN.

[Supplement to the Report of the Michigan State Board of Health for the Year 1892.]

[No. 366.]

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
Robert Smith & Co., State Printers and Binders
1892.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

IRON MOUNTAIN, OCTOBER 30 AND 31, 1891.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR THE YEAR 1892.

[No. 366.]

Robert Smith & Co., State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

IRON MOUNTAIN SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT IRON MOUNTAIN, MICH.

The thirty-sixth sanitary convention, under the auspices of the Michigan State Board of Health,

OCTOBER 30 AND 31, 1891.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1892.

This convention was held in compliance with an invitation from the Mayor and council and citizens of Iron Mountain, as follows:

Iron Mountain, Mich., October 6th, 1891.

Henry B. Baker, M. D., Secretary State Board of Health, Lansing, Mich.

DEAR SIR:—We have been having a rate of death in this city, from typhoid fever, that is simply awful. This sickness has become so serious that the city council recognized the fact that something had to be done to get the State Board of Health to come here immediately. And on last Monday night they appropriated the sum of $250 to defray the expenses of your board. As the cold weather sets in so early here it would be advisable for the board to come immediately. Rev. A. E. Cook who has written to you in regard to this matter, will forward you the necessary petition, and as the city council will defray your expenses, I know and hope you will do everything in your power to help us in this matter.

Please come immediately and assist to save the lives of the balance of the citizens.

Yours truly,

F. J. TRUDELL,
Mayor.

MEMORIAL FROM CITIZENS OF IRON MOUNTAIN, FOR A SANITARY CONVENTION.

Iron Mountain, Mich., October 2, 1891.

To the Honorable the State Board of Health, Lansing, Mich.

GENTLEMEN:—The undersigned citizens of Iron Mountain, Mich., believing that the public discussion of questions relating to the public health, under the auspices of the State Board of Health, would result in great benefit to our city, hereby respectfully petition that a sanitary convention may be held in Iron Mountain, under the direction and with the coöperation of your board or a committee thereof, at such date prior to Nov. 14th as you may be pleased to select.

F. J. TRUDELL, Mayor.
E. MEYER, M. D., Health Officer.
W. W. SWEET, Member of Council.
M. GOLDSWORTHY, Mining Captain.
J. H. McLEAN, Clerk of mine.
MARTIN KING, Mining Boss.
J. D. CAMERON, M. D., Mining Phys.
R. S. LINN, M. D., Min. Phys. Ass't.
A. F. WRIGHT, Merch't and Co. Treas.
CHAS. E. PARENT, Merchant.
JOSEPH A. HOWELL, M. D.
S. R. WILLIAMS, Pastor M. E. Church.
E. N. LEPPER, Ticket Agent.
B. H. SCOTT, Boot and shoe dealer.
E. J. INGRAM, Druggist.
THOS. J. EDGECOMB, M. D.
J. D. JONES, Dentist.
JNO. J. COLE, Merchant.
J. JAMES, Merchant.
G. T. CORNING, Merchant.
T. H. BARRON, Baker.
K. S. BUCK, Jeweler.
A. C. COOK, Attorney and Probate Judge.
H. M. PELKAM, Attorney for the city.
J. ORRISON, O. D. Co.
GEO. F. SEIBERT, P. M.
M. SEIBERT, Drugs.
LOUIS STOCKLY, Pharmacist.
OLIVER EVANS, Bank.
ANTON WESTIN.
A. H. HUNTING, Alderman.
A. J. RUNDLE, Merchant.
W. S. LAING, Capitalist.
R. P. TUTEN, Editor and Publisher.
ROBT. BANKES, Mine Superintendent.
H. McDERMOTT, Master Mechanic.
E. D. PARMELEE, Carpenter Boss with Ludington mine.
W. J. DAVIS, Surface Boss of mine.
JOHN M. SHANK, Pastor Central M. E. Church.
W. CATLIN, Alderman.
B. H. HOCKING, Pharmacist.
M. LEVY & Co., General Merchants.
G. W. GRENFELL, General Merchant.
T. B. CATLIN, City Marshal.
O. H. SYMOUR, Alderman.
W. J. SPENCER, Dentist.
T. J. SCANDLING, Grocer.
E. F. ABERNETHY, Supt. of schools.
JOHN T. McINTYRE, Cashier Iron R. R.
E. E. BREWSTER, Chemist.
E. F. BROWN, Member of Council.
A. E. COOK, Baptist Missionary for Upper Peninsula.

This convention was held under the direction of a committee of citizens acting with a committee from the State Board of Health.

The following persons constituted the various committees:

Committee from the State Board of Health—Henry B. Baker, M. D., Lansing.

Executive Committee—Hon. A. F. Wright, chairman; Rev. J. M. Shank, secretary; W. T. Carpenter, M. D.; A. C. Cameron, M. D.; George F. Seibert, E. E. Brewster, Oliver Evans.

Finance Committee—The city council.

Music Committee—W. J. Spencer, chairman; Prof. E. F. Abernethy, J. D. Jones.

Reception Committee—E. Meyer, M. D., and local physicians.

The officers of the convention were:

President—J. A. Crowell, M. D.

Vice-Presidents—Hon. John Perkins, Norway; William Kelly, Vulcan; B. W. Jones, M. D., Vulcan; R. C. Flannigan, Norway; C. D. A. Wright, M. D., Norway; John O'Callaghan, Sagola; Hon. John L. Buell, Quinnesec; Hon. M. J. Doyle, Iron Mountain; John T. Jones, Iron Mountain; Robert Bankes, Iron Mountain; Edmund Kent, Iron Mountain; Gordon Murray, Metropolitan; A. L. Foster, Foster City; A. F. Wright, Iron Mountain.

Secretary—Rev. J. M. Shank, Iron Mountain.

Among those not citizens of Iron Mountain who attended the Sanitary

Convention were: A. B. Simonson, M. D., Calumet; Charles D. Wright, M. D., Norway; Hon. John Avery, M. D., president of the State Board of Health, Greenville; members of the State Board of Health, as follows: Victor C. Vaughan, M. D., Ph. D., Ann Arbor; Prof. Delos Fall, M. S., Albion; Mason W. Gray, M. D., Pontiac; Hon. Frank Wells, Lansing; and Henry B. Baker, M. D., secretary of the Board, Lansing.

First Session, Friday, October 30, at 3:00 P. M.

As the president of the convention, A. J. Crowell, M. D., was absent, Dr. Cameron acted as president.

After a prayer by Rev. P. Munson, of the Swedish Methodist church, R. P. Tuten, editor of *The Iron Range*, made an unwritten address of welcome, which was not afterwards reproduced for publication.

RESPONSE, AND STATEMENTS OF OBJECTS OF THE CONVENTION.

BY HON. JOHN AVERY, M. D., PRESIDENT STATE BOARD OF HEALTH, GREENVILLE, MICH.

We are here in response to an invitation from your Mayor, the City Council, and leading citizens of your city. We are here to consult and advise with you in relation to matters connected with the health of your city, the prevention of disease, and especially of typhoid fever, the best source of water supply, and the best methods for the disposal of waste and excreta. We are not here to give advice as to the treatment of any disease; your physicians do not need advice in that direction. But the board does advise as to the best methods for the restriction and prevention of the more important diseases, particularly those which are known to be communicable.

In looking over the report of the proceedings of the State Medical Society of your neighboring state, Wisconsin, a few days since, I chanced upon an address delivered by the Governor of the state before that body of eminent physicians. The address was replete with wise and witty thoughts, but what attracted my attention most was the Governor's offer of a million dollars to the physician who would discover a cure for diphtheria. Now, we cannot offer you a cure for diphtheria or for typhoid fever, but we can offer what is better,—a preventive for them and for many other diseases. A cure implies sickness, suffering, loss of time and expense. Prevention does away with sickness, and its attendant suffering and expense, and is then better than a cure; besides, it is possible while a cure is not always so. And so, if a cure for one disease is worth a million dollars to a state, what ought prevention of many diseases to be worth to the same state?

It was reported to our board before we left home that over four hundred cases of typhoid fever had recently occurred here. We are glad to learn that an error has been made and that the actual number of cases was much less. But two hundred cases of typhoid fever means very much to a city of nine thousand inhabitants, composed almost entirely of working people and their families. Typhoid fever generally attacks those in middle life, the period of greatest productive capacity, takes about three months working time to each case, kills about one in ten, and causes much

suffering and expense. Two hundred cases then means six hundred months of lost time, which, at thirty dollars per month, means a loss of eighteen thousand dollars. And if you can reduce the value of human life to dollars and cents, the twenty who have died, valued at one thousand dollars each, makes an additional loss of twenty thousand dollars. Add to these losses the incidental expenses of not less than one hundred dollars per case, for medical attendance, medicines, nurses, etc., and you have twenty thousand more, making a total loss to your city in one year of fifty-eight thousand dollars, a sum more than sufficient to pay the interest on water-works and sewer bonds, and to defray the current expenses of your city government.

Typhoid fever is essentially a filth disease, and is most often communicated through drinking water. How that is obtained here it is not necessary for me to point out. Your city is no exception to other rapidly built cities of its size and similar location. The house, the cowstable, pigpen, privy vault, cesspool and well are all, for convenience, located in close proximity to each other. Filth is allowed to accumulate and the ground soon becomes saturated with it. The bottom of the well being the lowest point receives the drainage. You have here every facility for the cultivation, rapid growth and distribution of typhoid fever germs. You only need the seed to start in business; and you have not long to wait. A man from some fever stricken town seeking employment, is taken sick with the fever; he finds shelter in some of your many homes where he is kindly cared for. The excreta from this patient is thrown upon the ground or into the privy vault and in a few days finds its way into the well when the germs are ready for distribution to all who drink of the water.

To call your attention to the condition of your city, almost suggests the remedy. You must clean up everywhere—streets, alleys, back yards and vacant lots; drain and fill up stagnant pools reeking with filth from decaying vegetable and animal matter; furnish the people with pure water and compel them to use it, by condemning and filling up all contaminated wells. You must complete your system of sewerage which we are glad to see you have already commenced; and you must compel the people to connect with it, and to clean out and fill up and abandon privy vaults. You must establish a system of sanitary inspection and instruct the people how to keep their premises clean, and insist upon their doing it. Practical suggestions as to how these improvements can best be secured will be presented to you in the papers to be read before this convention and in the discussions which will follow.

The goodly number present at this opening session, speaks well for the interest you feel in the questions to be discussed here; and we hope and confidently expect your numbers and interest will increase until the close of the convention.

President A. J. Crowell, M. D., being absent, the convention suffered the loss of his address. Hon. Frank Wells, member of the State Board of Health, gave an address, as follows:

GERM DISEASES.

BY HON. FRANK WELLS, MEMBER STATE BOARD OF HEALTH, LANSING, MICH.

A clear conception of what we call the germ theory of epidemic diseases can only be had by considering the phenomena of decay and fermentation. Though the changes involved in such phenomena must have been going

on ever since the advent of life upon our planet, yet it is only during the present generation that their significance has been gradually learned. The discovery and perfection of the microscope has brought within the boundaries of our observation a third kingdom. It is to the inhabitants of this kingdom that we are indebted for most of the changes we observe in the living world about us. Though so small that the unaided eye has never beheld them, yet these inhabitants are never idle. Their influence is potent everywhere, either to maintain or to destroy. Through their malignant power, more than three-fourths of the untimely graves of humanity are filled. The air we breathe and the water we drink may be crowded with them, yet we see them not. Among them are those ever contending for our possession, and constantly seeking some unguarded spot upon which to plant the insidious seeds of disease and death. After these have done their worst, other inhabitants of this kingdom immediately take their places in order to prepare the stricken victim again for life. In the kingdom of death, life always wields the sceptre. Paradoxical as this may seem, it is literally true. No sooner do the life processes of an animal or a plant cease, than other life, in various forms, invades the organism and begins the work of disintegrating the complex structure and restoring to nature the elements from which it had been reared, to be again incorporated in living forms.

That this work which we call putrefaction is performed by successive generations of minute organisms is today too well known and too readily proved to be doubted by any intelligent mind, yet it was but a few years ago that the most distinguished chemist of his day, the learned Liebig, treated the theory with disdain. "Those who pretend to explain the putrefaction of animal substances by the presence of animalculæ" he wrote "reason very much like a child who would explain the rapidity of the current of the Rhine by the numerous wheels of the mills of Mayence." Liebig's belief and the belief of the scientific world of his day, was that oxygen slowly consumed all dead animal and vegetable substances. A simple fact shows this belief to have been entirely without foundation and that air freed from all bacterial life, has little or no effect upon organic substances. Fill a bottle with any putrescible article like beef broth, subject the contents to heat sufficient to destroy any life contained in the bottle and cork it immediately with a plug of cotton wool which has likewise been subjected to heat sufficiently great to sterilize or free it from living organisms. It is plain that the external air will have free access to the contents of the bottle but under conditions which will filter from it every trace of life, no matter how minute. If the experiment has been carefully conducted the substance in the bottle will remain unchanged for years. This clearly shows that it is *not* the air but the low forms of life with which air is laden, which produce those effects so familiar to us all when lifeless, animal or vegetable structures are brought into contact with it at ordinary temperatures and without the protection just described, or something equivalent to it. The process of canning fruits and vegetables common in nearly every home is an exemplification of the fact that once deprived by heat of the living products of change these substances, when hermetically sealed, remain in their original condition. The part played by micro-organisms in fermentation is as important as in that of putrefaction.

The wonderful work of the yeast plant, to which we are indebted for bread, wine, beer and alcohol, is a remarkable exhibition of some of the accomplishments of these organisms. If you expose sugar and water or sub-

stances containing them, like wine, cider, or malt, to the air you will find after a time that they contain myriads of oval living bodies. These bodies after reaching adult size, about $\frac{1}{3000}$ of an inch, put forth a tiny bud, and this very soon another, to be followed by a third and so on continuously, the process of multiplication being exceedingly rapid. Of course this growth can only go on at the expense of something contained in the solution and it is readily conceivable that a time is reached when the food supply becomes exhausted and the plant dies from starvation. During its life, however, it has wrought a complete and marvelous change in the solution that has nurtured it and has besides shown its ability to exist and flourish without the aid of that element usually deemed necessary to the existence of life, air. Upon investigation we find, instead of the sweet solution, a liquid containing carbonic acid gas and alcohol. These minute alchemists have mysteriously changed the sugar into these products. The gas as it has been generated, being heavier than air, has formed over the top of the liquid, preventing access of air and compelling the organisms to do their work without it. Their ability to wrest from the solution in which they exist oxygen and carbon and give them off as carbonic acid gas shows that they belong to the class of organisms called anaërobic to distinguish them from the class requiring the oxygen of the air for their existence and which are styled aërobic.

Like putrefaction, fermentation marks the first steps of the succession of changes whereby highly organized products are restored to the original simple elements of their composition. Each step in these changes reveals special and simpler combinations and is the result of the life work of organisms peculiar to its condition. After the alcoholic ferment comes the acetic, and the alcohol created by the action of one organism, by the action of another is changed to vinegar. In like manner in putrefaction after bacteria may come monads or mould to continue the disintegration already begun by previous organisms.

Besides the two general divisions of micro-organisms we have named, the aërobic and the anërobic, they are susceptible of three other divisions founded upon three several methods of reproduction.

The first is the budding or yeast plant variety already described; the second is the variety which reproduces by means of fission or division. The single cell of protoplasm which represents all micro-organisms divides in the center and becomes two, these two again divide making four, these in their turn divide and this process continues so long as conditions favorable to growth remain. The last variety produces spores or seeds. These seeds often float in the air, as do those of the thistle or dandelion, and are carried by the winds great distances from the places of their production.

The progeny of every species never varies from that of the parent. A long contest has been waged over the theory advocated by many scientific men that these organisms being the lowest forms of life known were generated under favorable conditions spontaneously. It was claimed that the appearance of life in all putrescible substances proved this to be true, but after it was shown that when such substances were sterilized by heat and were afterwards protected by hermetically sealing the bottles containing them or by filling the mouths of such bottles with filters of sterilized wool no changes took place in their contents, this theory was necessarily abandoned.

The presence of a living organism of any kind is now regarded as a

certain evidence that a similar one lived before it and was responsible for its existence. Each produces after its kind, and only after its kind.

Having now glanced at the grand series of phenomena by which all that is dead is transformed into those elements which are the substratum of life, and which are necessary if life is to continue upon the earth, and the rolê played in these changes by the minutest of organisms, let us now consider their even more potent influence in the destruction of life and health.

The similarity of much of the phenomena which characterize the lowest order of life and those which are peculiar to many diseases are very striking. Such similarity could not long escape the attention of physicians and other investigators into the causes of epidemics.

The conception that virulent diseases like ferments were caused by the action of micro-organisms gradually developed into a theory. Students in great numbers immediately entered this realm and almost before the new belief had reached the dignity of a theory it was elevated to the pinnacle of a science.

Most prominent among these students was a young chemist and naturalist who had already won a reputation for originality of research, accuracy in experiment and close reasoning. He brought to bear upon his labors a subtlety of penetration and an exactitude of method which placed him far in advance of other investigators in this field.

He had fought the battle of the cause of fermentation with Liebig, and that of the spontaneous generation of life with Bastion and others, and had come off in each of these important contests the victor.

None could be better equipped to demonstrate, therefore, the great fact that all epidemic diseases are caused by a class of minute organisms, similar to those which produce ferments, than this brilliant student whose fame now encircles the globe, Louis Pasteur.

The attention of Pasteur was first directed to an epidemic which in 1849 fell upon the silk worm nurseries in France. This he undertook to investigate, and to seek a remedy for. Two years were spent by Pasteur, his wife and daughter in this work. He demonstrated that the disease was caused by minute organisms which not only attacked the worms, but, in its germ form, was found within the tiny eggs of the moth. Careful selection and isolation of uncontaminated eggs was the successful remedy finally reached. Though this required vast patience and time it resulted in restoring wealth to an almost ruined country, and joy to a despairing people.

Pasteur next attempted to penetrate the mystery of a disease which for centuries had decimated the flocks of France and other countries, called anthrax. His method, which had now served him for twenty years, was simple and conclusive. A drop of anthrax blood was placed in a flask of some suitable infusion, previously sterilized by boiling, to free it from germs. In a few hours it was filled with myriads of bacteria. A drop of this first cultivation sown in a second flask, prepared in the same manner as the first, showed itself no less fertile. This was continued through twenty or thirty similar cultures, always with the same result. A minute quantity from the last culture, introduced at any time under the skin of an animal, would produce death from anthrax in two or three days. A great and valuable scientific fact had been demonstrated. The virulence of this disease was found to be due to living microscopic organisms.

An epidemic among fowls called chicken cholera was also found by Pasteur to be the result of a similar cause; and the disease, capable of trans-

mission through cultures, inoculation with any of which, produced all the characteristic symptoms of the malady, followed by death.

Pasteur's mind had long dwelt on the discovery of Jenner, and upon the significant question which it suggests that if one recurrent disease may be prevented by producing a mild form of such disease, why may not many others? In causing the microbe of fowl cholera to pass from culture to culture in an artificial medium, Pasteur permitted an interval of 24 hours to elapse between the time of sowing each successive culture. He then studied the effect upon the virus of increasing this interval. He found that when this was continued for several days, weeks, and even months, the contagium became weakened in power in proportion to the length of the interval. A virus permitted to remain in a flask, the mouth of which has been protected from the introduction of foreign germs by a stopper of cotton wool for three months, if used to inoculate fowls, will render them more or less ill but fails to produce death. But if this fact is extraordinary, the one which follows is much more so. If, after these fowls have recovered from this inoculation, they are reinoculated with a virulent virus or that which produces death in the uninoculated, they are scarcely even made ill. The conclusion from these facts is irresistible. The disease can protect from itself; and like most, if not all virulent diseases, it cannot attack a second time. The enfeebled microbe is shown to be a real vaccine, its power becoming attenuated in proportion to the time of its exposure to air. At any stage of enfeeblement, the virus may be kept, by being protected from the oxygen of the air in hermetically-sealed-glass tubes, for months or even years without change.

Could the microbes of splenic fever be attenuated so as to produce a vaccine for that fatal malady, was now the question Pasteur was called upon to face. The micsobe which produces the anthrax disease, like most similar organisms, reproduces itself by fissure or division while that of chicken cholera forms spores similar to the seed pods of plants. These spores may be exposed to the air for years without losing their virulence, but are always ready to reproduce their kind and manifest their power whenever they have found lodgment in the bodies of animals. After much research Pasteur learned that below a temperature of 45° anthrax bacilli produce no spores, and may be cultivated and attenuated in the same manner as those of chicken cholera. It is difficult to estimate the value of the practical effect which followed this discovery. Sheep and cows were vaccinated as rapidly as the virus could be obtained, and almost certain immunity was secured from the ravages of this malady.

The parasitic origin of epidemic diseases in animals having been demonstrated, investigations now turned toward the same class of diseases in man.

Dr. Robert Koch, of Berlin, already in his own country at the head of investigators of the mysteries and character of microscopic life, announced in 1881 that he had discovered tuberculosis to be due to the presence of a peculiar living organism. He had found a characteristic and hitherto unknown bacillus in all tubercularly altered organs. They appeared as slender, rod-shaped organisms, and were present in vast numbers, both separated and crowded into small, dense groups. He discovered them in all animals in which the disease existed, and in monkeys, dead from consumption, they were seen in countless bunches, pervading nearly all the internal organs. They have no motion but that of growth; and in the body, form spores which may float in the air and retain their virulence for a long time. They are readily cultivated in artificial media, and these

cultivations can be made to produce the disease by inoculation. Though successfully resisted by the life of a healthy lung, any hereditary or acquired predisposition which favors an inflammatory or congestive condition of this organ may permit the lodgment and destructive work of this malignant and deadly parasite. This distinguished bacteriologist is also entitled to the credit of discovering the organism which causes that most terrible of all epidemics, Asiatic cholera. That success has failed to crown the grand effort of his life to furnish to the world a method for protection against the ravages of consumption, is a most bitter disappointment. That effort in this direction will some time make available the knowledge we now possess to save humanity from the grasp of this infinitely small but terribly powerful destroyer, is the belief of many and the hope of all.

Every species of micro-organism has a distinct family form which never varies except, as do plants, through growth and changing conditions. *Bacteria* is a name now quite commonly used for all, though originally applied to those the length of whose bodies were several times their breadth. *Bacillus* is a term for a still more slender body. Both appear frequently in long chains. These vary greatly in size, an average length being about one-twenty-thousandth of an inch. *Micrococci* are small points or specs and form a very extensive class.

How do these minute forms, which only the most powerful microscope is able to reveal to the eye and then only by the aid of stains which affect differently the organisms and the surrounding medium, produce disease?

Many answers to this question have been presented. Another question allied to this, and of equal interest, is that of the means by which an attack of many diseases like measles, whooping cough, etc., renders the body proof against a second attack.

While it is evident that disease producing germs within the body may affect functional activity and seriously interfere with vital processes, yet it is apparent that such merely mechanical influences cannot produce all those destructive effects which signalize their advent. Among the earlier beliefs most generally favored was one that certain constituents of the body, necessary for the existence of the parasites which found within it their home, became exhausted. The objection to this belief is that the body is never so generally under the control of these organisms as to yield to them all its available nutriment. Besides, if the body should become depleted in this way, the supply, upon the removal of the cause, would be renewed.

The phagocyte theory has many adherents. This theory is based upon the well-known fact that the white blood corpuscles remove from the serum effete particles that have performed their functions. These leucocytes seem to possess an independent existence and are analogous to those primitive forms of life whose single cell of protoplasm serves for stomach and all the other organs of the more highly organized creations. They have the power of motion and wrap themselves about the food they wish to absorb. It is claimed that disease-producing organisms, entering a blood vessel, are at once assaulted by these corpuscles, and if possible destroyed. When it happens that the invaders are too numerous or too strong for their adversaries, disease and perhaps death to the body follows. There is much to make this theory seem plausible, notwithstanding the claim that leucocytes are scavengers rather than fighters. It is maintained that they are merely buriers of the dead, or, rather, open graves prepared to receive the bodies of the enemy, and not the soldiers who destroy the

2

lives of invaders. While the microscope has been constantly opening up to our vision facts relating to these obscure questions the aid of chemistry has been invoked to help us to understand the significance of the revelation.

It had been long known that during the changes taking place in a lifeless animal or plant, as its cellular structure was being broken down and resolved into its original elements, peculiar chemical substances were produced. Many of them had been analyzed and their composition proven. These products were known under the general name of Ptomaines.

They were invariably found to be the results of bacterial action, in the processes of fermentation and putrefaction. A large proportion of these were products found to be extremely poisonous. In many cases the most minute quantity introduced into a healthy animal would quickly affect the entire body, producing serious disease and death. These effects were analogous to those of the sting of a bee, the bite of a venomous reptile, or rabid animal, where absorption of the smallest amount of poison is followed by rapid, extensive and often fatal consequences. Knowledge of Ptomaines and their influence naturally led to the inquiry: why may not living tissue, equally with dead, exhibit poisonous ferments, when acted upon by bacteria? Cultures of organisms known to be the causes of various diseases were sterilized by heat and filtered. Such filtrates though entirely deprived of life, were found when introduced into the bodies of animals to produce all the characteristic symptoms of inoculation by the organisms themselves. This discovery has marked a long advance in our knowledge of the methods by which disease-producing germs perform their work, and has thrown much light upon the questions we are considering.

It should be added that the poisons set free by these germs have been subjected to chemical analysis and their properties, like the Ptomaines, have been expressed in chemical symbols. I can only allude to the important work of Dr. Vaughan, member of the State Board of Health, in discovering and isolating the poison produced in milk and cheese, which he named Tyrotoxicon. The same eminent chemist and his assistant, Dr. Novy, have obtained from cultures of the typhoid bacillus, found in drinking water which had produced typhoid fever in persons using it, an extract which caused cats to exhibit all the symptoms of the disease, with characteristic intestinal ulcerations.

Finally, chemistry, while throwing much light upon the problems, has greatly increased their complexity. We see clearly that much is yet to be learned before we can consider them satisfactorily solved. Some things, however, we are sure of. We know that a large proportion of the diseases to which the human family is subject is the result of the life processes of micro-organisms within the body; we also know that most of them are preventable. It will be for the various scientific gentlemen, who will address you during this convention, to point out how this may be accomplished.

The subject of Germ Diseases was discussed by Prof. Victor C. Vaughan, M. D., Ph. D., member of the State Board of Health, Ann Arbor; but, as his discussion was not in manuscript form and no stenographic reporter present, it is not here reproduced.

Second Session, Friday, October 30, at 7:30 P. M.

The convention was called to order by President A. J. Crowell, M. D. After music by Messrs. Spencer, Cole, Buck, Jones, Mrs. Rothman and Miss Wick, with Mrs. Ingram as accompanist, Mr. R. P. Tuten gave the following written address:—

THE WATER SUPPLY OF IRON MOUNTAIN.

BY R. P. TUTEN, OF IRON MOUNTAIN.

The water supply of the city of Iron Mountain consists principally of private wells, many of which are no doubt contaminated and contain the germs of typhoid fever and other fatal diseases; the water furnished by the Iron Mountain Water-works Company, which is drawn direct from Lake Antoine, and in my opinion is totally unfit for potable use; and the water supplied by the Chapin Mine system, which is of excellent quality, but accessible to only a small portion of the inhabitants of the city. The water in private wells becomes more and more polluted and unsafe to use as our population increases and the city becomes more closely built up. A large portion of the city is swamp land where wells receive the drainage of surrounding hills and cannot possibly give good water. In other portions the soil is a coarse gravel, where wells are fed with surface water with comparatively little filtration, and other conditions prevail which seem to make wells an unsafe dependence in any part of the city.

The water supplied by the Iron Mountain Water-works Company, as I have already said, is drawn from Lake Antoine, except such as may come from a well sunk in a swamp; and whatever water flows into the well other than from the lake, is drained from the swamp. The well does not cut any underground current, so far as I can learn, and is not in a free water bearing stratum. The site chosen for the well was selected evidently because of the ease with which the water from Lake Antoine could be poured into it. Lake Antoine has an area of 700 acres, and is not over 25 feet deep at any point. It has a muddy bottom, and particularly in warm weather the water has a strong and disgusting odor, and is polluted by the silt and filth of the bottom, which is stirred up by the slightest wind and thoroughly charges the water with this unwholesome ingredient. A horse will refuse to drink it.

Located on the west shore of Lake Antoine is a large brewery now in the course of erection. The drainage from this brewery must necessarily flow into the lake. Dwellings are located on the shores of the lake and more will be in the future, and the drainage of many of these houses will of necessity go into the lake. So, as polluted as Lake Antoine water is today, it is destined to become more so in the near future.

The first move that was made toward providing a system of water-works for Iron Mountain, that promised success, was made in 1887 by the village council, which was in existence about six months before the incorporation of the city. It was proposed that the village build and own the works. Messrs. J. T. Jones, Per Larsson, Edmund Kent and P. O'Connell were appointed a committee to devise the best plan to be adopted and to select the best available source of supply. This committee rejected Lake Antoine as being totally unfit for the purpose, and after considering the feasibility of depending on a supply that might be collected from the Chapin and Ludington mines, finally settled upon the springs at the Quinnesec Falls as the source from which an ample supply of excellent

water could be had. Mr. Burlingame in his report stated that the supply was 800 gallons per minute, and that this supply could be developed to a much larger amount. The estimated cost of the works was about $100,000 and the estimated revenue from private consumers was $8,000 per annum. As the works were to be owned by the city there would have been, of course, no hydrant rental. The population of Iron Mountain at that time was 5,291. The last census showed it to be 8,484 and today it is probably between 9,000 and 10,000. The Iron Mountain Water-works Company, if it ever succeeds in getting a franchise from this city, will receive $9,000 a year hydrant rental, and with the extensions now needed that amount will be increased to probably $12,000, and it is safe to say that its income from private consumers will be as much more, so I contend that the revenue that will accrue to the water-works company will be ample to justify any necessary expense in providing this city with the best water obtainable.

Prof. Dunham, of New York City, who made a personal examination of Lake Antoine and its surroundings, with three other contemplated sources of supply, says of it:

"The locality examined near Lake Antoine (namely the locality now occupied by the water company's works) offers some advantages over any other. It is nearer to the city, and the works, if built there, would furnish surer protection and would be an attraction and an improvement in that part of the city. But the probable growth of the city in the direction of Lake Antoine, and the chance of pollution as a result of this growth, render that source of supply less attractive, and it is my opinion that works should not be established there." Of the water at Quinnesec Falls, he says: "The springs at the falls furnish a quality of water that leaves little to be desired, etc."

On the 8th of April last, Prof. V. C. Vaughan reported on samples of Lake Antoine water. The samples were taken from the water works well, city hydrants, and outlet of Lake Antoine. His conclusion was as follows:

"The comparatively large amount of organic matter in these samples is due wholly to vegetable matter. There are bits of dead leaves and sticks in the bottles. Had the water been passed through a filter before being submitted to analysis the figures would have been much more favorable. It would be interesting to know with what care the samples were collected, and how far from the shore the lake water was taken. However, notwithstanding the presence of this vegetable matter, the small amount of chlorine, which is practically the same in all the samples, shows that there is no sewage contamination, and the small number of germs, and the fact that all of them are inocuous, leads me to pronounce the water as a perfectly safe one."

It is evident that the professor was ignorant of the most important sanitary conditions pertaining to Lake Antoine water, and had the samples been filtered he would have been still more deceived, because the water is delivered to the company's consumers charged with the bits of dead leaves and sticks and such fishes and polliwogs as find their way into the company's pipes. The samples were taken while the lake was yet frozen over and the water was in its best possible condition. The professor says in his report that the water has no odor, which is not true during the summer months. It has a most perceptible and repulsive odor; in fact at this time, notwithstanding the frosty nights and cool days, there is an odor to it that is easily perceptible if the water is heated. He did not know that the lake water is to be contaminated with the drainage from a brewery and

a slaughter house and from possibly hundreds of houses on its shores, and that the well is located in a basin that will receive the drainage of a large area that is likely to become thickly settled.

So far, I have spoken only of the present water supply of this city. The Water-works Company admit that they are furnishing poor water, and have sunk a gallery on the east shore of Lake Antoine and close to the water's edge, where they claim they have an ample supply of good water. They will reach this supply by thin pipes laid through the lake. They claim that their gallery is fed principally, if not entirely, by springs independent of the lake. I have visited their gallery several times while the work has been going on and I have never been able to discover any great amount of water coming from the hillside. Almost the entire inflow has been from the lake, and the best possible result to be obtained, in my judgment, will be lake water filtered through a few feet of coarse gravel. In time this filter will become so impregnated with the impurities of the water passing through it, that it will cease to become a purifying agent. The pipe that passes through the water of the lake is so thin that it seems to me its life must be short, and considering the steps that the city council have been forced to take before the Water-works Company would make any move toward getting a better supply than what they have been using, I anticipate that when through leaks in the pipe from the gallery to the well or by contamination of the well itself, the water is again found to be poor, admitting that for a time it is good, we shall have still greater difficulty in compelling the Water-works Company to take any steps to remedy the evil. Theoretically it is to their interest to furnish the most satisfactory water to be had, but practically, with a monopoly that can say "take what we give you or go without," it is very different. People will put up with a very poor article when it is the only thing of its kind in the market, and when that article is one of the necessaries of life. We can't do without water, and corporations have no souls. While it is in the power of the people of this city to enforce their demands, they should insist upon a perfectly safe, ample and wholesome water supply.

THE WATER SUPPLY OF IRON MOUNTAIN.

DISCUSSION LED BY E. A. ORDWAY, IRON MOUNTAIN.

LADIES AND GENTLEMEN:—In taking up the discussion of the water supply of Iron Mountain I will not attempt to enter into it scientifically as I am not competent to do so, but will give the evidence of chemists who are qualified for this class of work. It will be necessary to a certain degree to touch upon the subject of drainage, as the water supply and drainage must go hand and hand to insure the perfectness of each other.

The present supply of Iron Mountain is from the various wells throughout the city and from the water-works. The latter takes its supply from a well in the north part of the city which is reinforced to a certain extent from Lake Antoine. A glance at the natural surroundings of Iron Mountain is assurance enough that wells cannot be maintained with any degree of safety in some portions of the city. The greater and most thickly settled portion being situated in a veritable swamp, where surface water remains on the ground most of the year with no avenue of escape and which is constantly being reinforced by the drainage from its own area, also from the higher portions of the city; and according to the local physicians'

reports, the ground has become saturated with the germs of the disease which is bound to make itself prevalent during a drouth or low water in the wells. Many of the dwellings in this locality are tenement houses, and it is no uncommon thing to find situated on a 50-foot lot, two houses 16x24, two stories high, each house containing four families, whose dumping ground for refuse is the street, and their supply of water, a well in the back yard, possibly situated near some outhouse or cowshed. I have on my books a record of one landlord that was paying water tax for 14 families contained in four houses no larger than above mentioned and standing only a few feet apart. This supply was closed off for the reason that the repairs to the hydrant were so great and the water tax too high, and the tenants were forced to the well water. These causes can to a certain extent be obviated by a good system of drainage and a little care on the part of the health officer, but for some years to come with all the precautions taken it will be dangerous to rely upon wells in this section for a water supply, and the only resource is to the water-works, but such a feeling and prejudice has been worked up against the water furnished by the Water-works Co., that many, even by the advice of their physician and the assurance of prominent chemists that the water contained no disease germs, were afraid to use it. The cry of bad water and the press arraying itself against the company which was at first "bad dog" soon became "mad dog," and matters continually grew worse. But an outline of the efforts put forth by the Water-works Co. to get a supply of water for the people, that prejudice could not shake, will perhaps be of interest to many.

The original intention for a water supply was from a well which the company located in the north part of the city, isolated from the habitations and free from any of the city's drainage, but the well not producing a sufficient quantity of water it was found necessary to reinforce it from other sources. Samples of water were taken by Alderman Sweet and W. R. Coats from Moon lake and Antoine lake and sent to Dr. Kedzie, of the State Agricultural College at Lansing, for analysis, and his summary on both samples was that the water was very good (this was Jan. 10, 1891). From this report we felt justified in reinforcing our well from Lake Antoine, which we did by laying a temporary pipe from the lake to the well, intending as soon as spring opened to lay the pipe to springs we had located in the center of Lake Antoine. In the following March we presented the works to the city council for acceptance, and it was at this meeting that the company first found that there was any doubt in regard to the quality of Antoine Lake water, and the acceptance was laid over until an analysis of the water could be obtained with assurance to the company that if the analysis proved all right the works would be accepted without delay. Samples of water were procured by the council and forwarded to Prof. Vaughan for analysis and this is his summary: "Although the amount of organic matter in these waters is larger than that in the best drinking waters, the absence of germs renders the water in its present condition in my opinion perfectly safe. Certainly these waters cannot induce disease so long as they are free from germs."

This was not satisfactory to the city and we were informed that Lake Antoine water never would be satisfactory, and further, that an analysis never would determine a water supply for Iron Mountain. As an analysis would not determine it we asked the council to coöperate with us in finding what would be a satisfactory supply and was promptly informed that

it was our business to find it and not for the city to do it for us. Not being able to secure the coöperation of the city and having the assurance that chemistry would not be taken to determine the quality of water, we were thrown entirely at sea, our only course to pursue was to rely upon our own judgment, which we accordingly did by preparing to run our pipe to the springs in the center of Lake Antoine where the water had been pronounced good and wholesome by two of the leading chemists of Michigan. At this time the health doctor complained to the city that the water-works water was producing disease in the city. We were asked to shut down our works and stop furnishing our customers water, which we positively refused to do. This led to the city declaring the works a nuisance, and disfranchising us. Representatives of our company at this time visited Iron Mountain for the purpose of getting an amicable settlement of the matter if possible. Representatives of the city and our company visited Moon Lake and this was determined on as a source of supply; samples of water were obtained and brought to the City Hall and we began getting the necessary right-of-way to run our pipes there. A few days after the council was in session and they discovered that the samples of water obtained from Moon Lake had an odor, and we found that this would not be satisfactory. We then learned from Mr. J. T. Jones of a spring on the north side of Lake Antoine and visited the place with him.

We commenced to develop the spring and found that a sufficient quantity of water could be obtained and of a quality that is unquestionable, and determined upon it as a supply. In the meantime the city attempted to get out an injunction restraining us from using the streets and alleys to furnish our patrons with water. The day before the case came before the judge, they sent Mr. Robert Banks to Menominee with a proposition, if we would lay our pipes around the lake instead of through, as we intended, they would settle the matter for all time. We accepted this proposition, and asked the council to ratify the same and place us in a position to condemn land, which they positively refused to do. This forced us to lay the pipe through the lake, and I am pleased to state we now have the pipe within a few feet of the spring, and before another week we are in hopes of having spring water into the city of Iron Mountain.

The subject "Water Supply of Iron Mountain," was discussed by Prof. Victor C. Vaughan, M. D., Ph. D. member of the State Board of Health, Ann Arbor, but no report of his remarks has been obtained therefore it is not printed in this pamphlet.

Rev. A. E. Cook said: He would be glad to have stated to the audience by Doctor Baker, in case the water supply of Iron Mountain were taken from the galleries near the distant shore of Lake Antoine where the Water-works company are now at work, what would be the result if the vicinity comes to be inhabited—residences being constructed in that vicinity?

Doctor Baker replied: That would depend very much upon circumstances, such as whether the residences were all provided with house drains, and whether sewers promptly intercepted all sewage from contaminating the water shed from which the water supply is derived. Of course, however, the same would be true of any water supply from whatever source. Its present purity is no guarantee of future purity, unless thorough measures are taken to guard it, through all future time. From whatever source the water supply is to be derived, the city must constantly guard against its future contamination.

Mason W. Gray, M. D., member of the State Board of Health, Pontiac, gave the following written address:

THE RESTRICTION AND PREVENTION OF TYPHOID FEVER.

BY MASON W. GRAY, MEMBER OF THE STATE BOARD OF HEALTH, PONTIAC, MICHIGAN.

Typhoid fever has been called the great fever of the modern historical epoch. As Typhus was the scourge of European countries in times past and the malarial fevers the bane of our early pioneers, so typhoid fever has come to be the great desolator of modern society. Although its origin probably dates back to antiquity, it was not sufficiently prevalent, or at least it was not sufficiently understood, to be recognized as a distinct disease until the present century. It has now come to be so thoroughly disseminated that there is no country, no climate and no condition that has not been visited by it. There is no civilized community that has not felt its blight. As an instance of the prevalence of the disease in our country, I point to the 350,000 of our fellow citizens who are annually prostrated by it. In our beautiful State of Michigan, 10,000 are sick with it every year, and 1,000 of the young and vigorous members of our commonwealth are sacrificed by it.

But it is unnecessary here in Iron Mountain to dwell upon the character of this disease. You know too well by a terrible experience, all about its characteristics. Many of you have been sorrowing witnesses in your own homes of its symptoms and of its fatality. Aside from the suffering those who have the disease undergo, there are remote effects of typhoid fever, which few, if any, of its victims escape. The poison produced in the body by the bacillus of this disease permeates every tissue, ofttimes causing structural changes in the parts, which never again become normal. You often see those who will tell you, they have never been so well since having typhoid fever as previously. The fact is, after a severe attack of typhoid fever, the vital functions are so prostrated that they never again completely recover. They are likely ever after to remain below par and as a result of this lowered vitality the system is less able to resist the invasion of other pathogenic germs, and hence many who are carried safely through this disease, afterwards fall victims to consumption.

But the great question with you today is restriction and prevention. This consideration involves a knowledge of its causation and methods of transmission. You are all well aware that the exciting cause is a specific germ—a micro-organism—called sometimes from its shape and appearance under the microscope, the bacillus of typhoid fever. At least this is the primary cause. Dr. Vaughan has shown that many of the most alarming symptoms are caused by the poison produced in the human system by this bacillus. For years, however, before this germ was discovered, the fact that typhoid fever was communicable had been proved and the method by which the germ was conveyed from one person to another was quite well understood. It was pointed out by observing physicians, that the most frequent way the disease was contracted, was from contaminated drinking water. And one of the most striking instances on record of the communicability of the disease through the medium of drinking water, was published nearly fifty years ago by Dr. Austin Flint.

In a small settlement in the western part of the state of New York lived forty-three persons in nine houses, which were grouped around a tavern,

the house farthest from the tavern being ten rods distant. With one exception, all the families of the little hamlet obtained their water from the tavern well, which by the way, was near the privy vault. This family for some reason was not on good terms with the tavern keeper, and were obliged to dig a well of their own. This village had never known the ravages of typhoid fever, until a stranger traveling by stage-coach, which passed through, being too ill with this disease to proceed, stopped at the tavern, and died in a few days. In a short time after, members of the tavern-keeper's family sickened with the same disease; soon after other families were afflicted, and within a month, half of the inhabitants of the settlement were taken sick with the disease and ten had died. The one family which escaped was the one using water from a well of their own, instead of the tavern well. This occurrence caused great excitement at the time, for as the disease was not well understood at that time, and the family who had been ostracised in that little community was charged with poisoning the well. But now we can look back upon the facts in the case and see that those people had been drinking, perhaps for years, the water from that well contaminated with the leachings from that vault without serious injury, until the stranger brought to the scene the fatal disease. The discharges from this patient, with the disease germs, found their way into the well water and hence into the systems of those who drank water from the well. Although this was one of the first published instances, showing that typhoid fever is caused by drinking water contaminated with sewage, many hundred similar instances have since been published and every practicing physician has seen abundant proof of the same thing. And so it has come to be regarded as an established fact, that when people practice the abominable custom of digging two holes in close proximity, into one of which is deposited the excretions, and from the other is pumped the water supply, there is danger of typhoid fever; and this is true to a still greater degree in villages and cities where this has been going on for years. There is a popular belief, that water which finds its way into a well by leaching through the ground a few feet, no matter whence it comes, or with what it has been contaminated, is thereby purified and rendered potable. This may in some instances purify it; but nevertheless there can be no safety in well water in communities where privy vaults and cesspools abound. That water which has filtered through the ground is unreliable, the following incident will illustrate:

A few years ago, a little town in the mountains of Switzerland was regarded as so healthful, that it was resorted to by many in the summer time for the benefit of their health. But it came to pass, that on the other side of the mountain, one mile from the spring where half the villagers obtained their water supply, a man lay sick with typhoid fever. The discharges from this patient were emptied into a stream of water, which was used for irrigating the pastures. This water percolated through that mountain a distance of one mile and flowed into that spring, so clear, cool, and sparkling, that no one dreamed it was anything but pure and wholesome; but it brought with it the germs of disease from that typhoid fever patient and consequently of those inhabitants, who drank water from the spring, many of them sickened with typhoid fever, but of those who obtained water from another source, none were affected. That the fever patient on the other side of the mountain was the starting point of this little epidemic, absolute proof was produced, but I need not recite it here. Of course where the water supply of a place is through a system of water

works instead of wells, the source may be contaminated, as in the case of your neighboring city of Negaunee, where they have been pumping their drinking water from a little lake and pumping the water from their mines into the same lake, and where they have had a fearful experience in consequence. Up here at Baraga, they have been pumping their water from L'Anse Bay near the shore, and emptying their sewage into the bay near the water pipe. At that place there live about 1,000 people and they have had during the past few months something over 100 cases of typhoid fever, and about 10 deaths.

But there are other ways the germs of typhoid fever enter the system. Sometimes ice containing the bacillus is put into water to cool it and thus the disease is conveyed; for freezing does not destroy this little micro-organism. Milk sometimes carries the disease, either by being diluted with infected water, or by being placed in dishes which have been washed with water containing the germs. This fact was well illustrated a few years ago in London. In a certain part of that great city, a good many families were simultaneously affected by typhoid fever. The health officials found, when they came to investigate the matter, that all the afflicted families obtained their milk from the same milkman. On visiting his dairy, they learned that two or three members of his family had been sick with the same disease. The location of the well was such as to throw suspicion on it. The health authorities at once put a chain and lock on the pump with the result that no more new cases of typhoid fever occurred among the patrons of that dairyman. I leave you to draw your own conclusions as to how the typhoid fever germs were conveyed from that well to the patrons of the dairyman in London; but evidently the well water got mixed with the milk in some way. In justice to this milkman, however, I will say that he insisted that he never pumped water into his milk cans, except to wash them out.

Occasionally the disease is conveyed in other ways than through the water supply. A few years ago typhoid fever occurred in the State Prison at Jackson, and the prison officials were unable to ascertain the cause of it. They therefore requested the State Board of Health to investigate the matter, which was done. The Board found that the outbreak there in the penitentiary was due to defective sewers. The sewer gas, which had in some way become infected with the typhoid bacillus, penetrated into the cells of the prisoners and caused many cases of the disease. The State Board of Health recommended that the sewer be thoroughly disinfected and then reconstructed in a more perfect manner. These recommendations were promptly carried out with the result that typhoid fever ceased to prevail at the prison.

The mattresses used by typhoid fever patients, their bed linen and clothes, have each been the medium by which the disease has been communincated to others. This is unquestionably due to the fact that these articles are sometimes soiled by the discharges of the patient and not immediately disinfected after use. A high authority has stated that the sputa of a typhoid patient under certain conditions contain the germs of the disease, and cites a case in which it is probable that this was the means by which the disease was propagated.

Knowing the means, by which the disease is spread, it would seem that the necessary methods to secure its restriction and prevention would be self evident. There is abundant evidence, however, to convince the most skeptical, that the restriction of typhoid fever varies directly with the

purity of the water supply. The records of many cities in our own country, that are complete and trustworthy, for the past twenty-five years testify to this fact. Brooklyn, Boston, New York and Philadelphia have a death rate from typhoid fever proportional to the quantity of sewage which enters their water supplies. Where the water supply is free from sewage, as is that of Brooklyn, the death rate is low. Where care is used to exclude sewage from the watershed, which furnishes the water supply, there is a corresponding freedom from typhoid fever, as is instanced by New York and Boston. In Philadelphia, however, less care is exercised to secure water free from sewage contamination and in that city the typhoid death rate is correspondingly increased. The history of the water supply of the city of Baltimore is interesting in this connection. This city has had a constantly diminishing death rate since the water supply was first introduced, and the decrease has been more notable since 1880, when the supply was largely extended. This has all been brought about by the substitution of a pure general water supply, for water from infected wells.

We see the same result produced in foreign cities. In Vienna from 1851 to 1874 well water was used in connection with a system supplying a part of the city from the Danube. During this period the death rate from typhoid fever ranged from 100 to 340 annually in every 100,000 of the population. In 1874, however, pure spring water was introduced into the mains with the result that the death rate fell at once to 50 per 100,000. Since then by the disuse of impure well water and the extension of the pure water supply, the death rate was reduced to 11. As an evidence that the reduced rate was brought about by the introduction of the pure spring water, this interesting fact is recorded, that in the fall of 1877 the source of the spring water was frozen up for a time, necessitating the use, by a part of the city, of water from the Danube. This was immediately followed by an epidemic in those parts of the city to which the water from the river was pumped; on resuming the spring supply, the disease again disappeared. Indeed typhoid fever has become so rare in Vienna, that whenever a case is received in any of the great hospitals of that city, it is exhibited to the medical classes as a curiosity. (Rep. of Com. on Pollution of Water Supplies to Am. Pub. Health Association, 1888.)

The first great step then necessary to secure safety from attacks of this disease in cities and villages, is to secure a general water supply that is pure, one that is free from contamination with sewage, one that is free from the micro-organism of the disease and one that is capable of being maintained pure and free from danger.

Here in Iron Mountain I am told that you are constructing a system of water-works. No pains should be spared to secure a supply that is above suspicion. No expense should stand in the way of securing a supply from a source that is pure and that can be maintained in a state of purity. It will be found easier to pay well for pure water than to suffer a continuation of the scourge that is upon you. But a general water supply for a city the size of Iron Mountain cannot be secured in a day, especially if there are unusual difficulties in the way. Can nothing be done in the meantime, to prevent the spread of this dreadful disease? Yes; as many of you who know boiling contaminated water will kill disease germs that chance to be in it. So that until water is obtained that is known to be free from danger, boil it and boil it thoroughly. Do not be deceived by the will-o'-the-wisp known as a filter. No filter can remove the germs of disease from water. This was shown by the experience at Lausanne,

which has been referred to, where the water filtered through a mountain range the distance of a mile and appeared in the spring on the other side as cool and sparkling and sweet to the taste, as only spring water can be; but it brought the germs of disease to the inhabitants of that little village. It is sometimes well to filter water after boiling it, but filtering alone is not reliable as a sanitary measure.

Now it is obvious that if it were possible to prevent the spread of the germs of this disease, it would be possible to prevent the disease itself. This would be practicable if every community and every individual could be enlisted and all united in an earnest warfare against this insidious foe. In the sick room we can most easily conquer. The methods which have been found most effective are concisely stated in a little pamphlet issued by the State Board of Health, which any one may have without charge. The most important thing to be done, perhaps, is to disinfect all discharges (from the patient sick with typhoid fever, including also the sputa.) This can conveniently and safely be effected by the use of the solution of chloride of lime known as "Standard Solution No. 1." This contains four ounces of chloride of lime to each gallon of rainwater, all the bed linen and other clothing used about the patient should be disinfected by boiling in the zinc solution which is recommended in the pamphlet just referred to. The room in which has been a case of typhoid fever should be disinfected with the fumes of burning sulphur, as soon as practicable after the termination of the case. Now if all these details are conscientiously attended to, if all the germs, which have been scattered about the room, are in every case of typhoid fever, killed by sulphur fumigation, if the bedding and clothing used around the patient are disinfected, and all those which are eliminated from the patient, are promptly destroyed in every instance, it only remains for us to guard well our water supplies and sooner or later we shall effect a very great decrease in the sickness and mortality from this disease. Indeed in view of the success which has resulted from such measures as have been detailed, it is not too much to hope that if a more general activity might be aroused, such results would follow, that the beginning of the twentieth century would witness the almost total elimination of this disease, the prevalence of which at the present time is a blot on the fair name of an enlightened civilization.

Third session, Saturday, October 31, at 2:30 p. m.

The convention was called to order by Rev. J. M. Shank, secretary of the convention, who acted as chairman. Prof. E. F. Abernethy, Superintendent of Schools, Iron Mountain, gave a written address, as follows:

SCHOOL HYGIENE.

BY PROF. E. F. ABERNETHY, SUPERINTENDENT OF SCHOOLS, IRON MOUNTAIN.

The object of this convention, as we understand, is the discussion of laws relative to the maintenance of the health and life of this community, with the avowed purpose of bringing about their application. To us has been assigned the duty of presenting to this convention, in this paper, some thoughts on the application of these laws to that part of the community which a portion of the time is given to the care of the State.

In other words, five mornings out of the week 1,000 children, from every section of our city, after more or less preparation, assemble at assigned places, for a definite portion of the day, for the development of their mental faculties and for instruction. What agencies are there that are in common and constant use that will render the growth of these children more perfect, decay less rapid, life more vigorous, and death more remote?

It is not necessary for us to urge the importance of this division of the work that is before this convention. The susceptibility of the younger children of school age to the contracting of disease, often so fatal, is well understood. This fact alone should call the attention of every community to the strict observance of all laws operating for the prevention of contracting diseases of such malignant character. But further than this and equally as important, though, perhaps, not so evident, is the necessity of inquiring into, with the purpose of eliminating, the violation of those rules of health that are not immediately fatal to life, but which bring about an imperfect growth, weaken the system, lessen the mental vigor and ultimately result in a burdensome life and an untimely death.

The former is the most fearful to contemplate because death seems so immediate and the means of prevention so few and impotent. The massing of such a large number of children in one place and bringing them in contact with one another is the chief means of the propagation of such malignant diseases.

That which is the chief cause of the spread of such diseases, it is readily seen, is impossible to avoid. In this respect school authorities, the teachers, the board of education, are powerless. No matter how stringent the rules of the school board may be regarding the attendance upon school by persons tainted with these diseases, no matter how close the teacher may scrutinize, an infected one appears, the contagium is spread, and the saddest of all, as in the cases of diphtheria which appeared in our community two years ago, one-half of the unfortunates come to their death. But though this is so awful to contemplate the results of the latter are more general and, considered as a whole, equally as serious. The hopelessness, however, is not so great, as their prevention is much in the power of school authorities and only remains for their operation.

Let us first consider briefly what observance of hygienic laws directly appeal to the teacher's enforcement. The teacher meets her pupils, perhaps 50 in number, in a room 26x30. All classes and natures are represented. There are those whose parents are careful regarding cleanliness of person and clothing, and others who exhibit no attention shown to them in this respect. Some are of a highly sensitive nature, timid and despondent, others are careless and indifferent. The healthful surroundings frequently are not the best. There may be no means for the admission of fresh air except through the windows and doors, and the light is admitted from two opposite sides, or from the front and rear. In every session the customary fifteen minutes recess is the order. Frequently the days are cold and the weather disagreeable. A few only care to pass out. The windows cannot be raised or lowered because of chilling draughts. The work of the term is at hand and must be accomplished. What hygenic problems here present themselves to the teacher for consideration?

First, there is the guarding against overwork. Many emotional natures cannot endure censure. Characteristic of them, inducements in the line of prizes, merit marks, and public exhibitions, are such that will cause them to attempt more than their physical system will endure. Study is

not injurious to health. The natural laws of the mind admit of development without detriment to the system, if they are not perverted. Here must be brought into action a teacher's full genius. The amount of work she frequently cannot control. With the regular work of the old fashioned common school branches, in order to keep up with the times, there must be added the improved system of form drawing, a few minutes each day must be given to the study of music, manual training must receive attention, our State university perhaps has increased the requirements for admission, the course of study must be revised and the work within the same alloted time respread, and then the hygienic effects of the use of narcotics and alcoholic drinks upon the human system must be taught so many minutes a day, so many days in a week and so many weeks in the year. Is it any wonder that a teacher frequently finds her powers inadequate and, though she guards the sensitive natures against timidity, despondency and anxiety, and tries to make the school life of the discontented boy a pastime, that so frequently the system of the pupil finds it impossible to bear the mental strain?

But overwork is not always the real cause of ill health brought on by attendance at school. Most frequently it is the want of fresh air and proper exercise. The subject of ventilation we will take up further on.

Relaxative exercise of some kind is certainly necessary each session of the day. It has always been considered to be a necessity. But as to the methods of taking it there is a difference of opinion. Many declare that the old-time recess of fifteen or twenty minutes is the most healthful. Others claim that frequent movements, light gymnastics and similar exercises in a well-ventilated room under the direction of a teacher is much more conducive to good health. The discussion of the varied phases of this subject would constitute a paper in itself.

With the close attention of the teacher toward using all of the means possible for supplying fresh air and giving proper exercise to the pupils, there still remains a demand upon her as to the position the pupil assumes in their work, the care of the eyes, and carefulness as to the cleanliness of their persons and clothing. For the perfect growth of the pupil attention to these points is necessary, and the boy or girl approaches manhood or womanhood with a physical constitution strong for the requirements of life's duties, or handicapped as the degree to which these hygienic laws have been used in their education.

For the good health of our children what now appeals to the board of education? Section 7 of our city charter defines the duties in part of the board of education as follows: "The board of education shall have authority and it shall be their duty to designate and establish such number of sites for school-houses in the district as may be necessary and to erect and maintain thereon suitable school-houses and buildings for the use of the public schools, and to provide the proper furniture and appurtenances for such buildings and grounds."

One of their first duties is therefore the selection of a site. In the selection of a site, besides the question of convenience of location, is that of drainage. If the only available place, in a crowded district, for convenience of location is a swamp, should that be selected to one more healthful though farther away? How is the drainage and sewerage? Is there sufficient room for fresh air and sunlight, or will the rising fumes from adjoining back yards pour through the windows for the pupils to inhale? All

these are hygienic questions that present themselves in the selection of a site.

The next duty announced in this section of the city charter is the construction of suitable school buildings. This is a prescribed duty of the board, and, though this law has remained the same for a number of years, it slowly and surely has been undergoing a change. It has been considered that a building that would protect the children from the outside elements and allow sufficient light for the carrying on of their work was suitable. But what was considered suitable twenty-five years ago is not considered suitable to-day. Some cause (perhaps it is the influence of the State Board of Health) has been working to the effect that in the construction of a school building there are other considerations besides the simple protection from the weather and the furnishing of light. Some of those considerations are the height of the buildings, the spaciousness of the rooms, the sources of light, and the furnishing of heat and air. This brings us to some of the most important subjects in school hygiene,—lighting, heating and ventilation.

The placing of windows through which a school room receives its light is generally left to the architect or contractor. If they consider the health and convenience of the pupils, more than architectural symmetry, they will arrange them so as to admit the light from the left and rear. A cross light is injurious to the eyes, and a front light should always be avoided.

The warming and ventilating of a building has always been and still remains a vexing problem. They have been developed in the order in which the terms are connected. The warming of a room was thought at first the only thing necessary. The windows were made to raise and lower, simply for the purpose of reducing or permitting the temperature to increase. A system of ventilation is something of later development. The old, old fashioned way was the fireplace. It has given way to other systems, but we question if in the line of good health, it has been an advancement. Stove heating appears next in chronological order, followed by furnace heat, steam heat and heat from hot water. The great question in heat has been evenness and uniformity in temperature. This has not been so difficult to attain, considered alone, but since the demand for fresh air has been so great, the problem has become more difficult. It is claimed by many, and it is rapidly gaining ground, that the proper solution of it, is the connecting of the systems of heating and ventilation into one. There are others that contend that an artificial or mechanical method of moving the air is the most perfect, and together with steam heating or hot-water heating is the most healthful. The discussion of the points of advantage of one system over another, the time allotted for this paper will not permit. After calling attention to some facts, making the development of this subject a necessity, we will try to present how near the board of education have met the requirements of the times in the construction of the school buildings of this city.

Air is a mixture of various elements arranged in definite quantities. Any cause that tends to increase or diminish the quantity of one element over that of the others, diminishes its life-giving and life-sustaining power. Physiologists long ago announced the fact that an excessive amount of carbonic acid, if not so intensely hurtful in itself, represented an amount of matter existing in the air which received into the lungs was very injurious to the system. This carbonic acid in the air and its accompanying organic matter of unknown composition is greatly increased by exhalations

of healthful persons. Where forty or fifty pupils are assembled together for two or three hours at a time, the air becomes in a few minutes made up of this carbonic acid and organic matter thrown off, produces a disagreeable odor, and poisons all who inhale it.

It is readily seen that a building constructed suitable for school purposes should be so arranged as to have drawn from it the poisonous matter, and replaced in its stead air containing the proper life-giving elements. This necessitates what is termed ventilation, and has brought out the different systems to which we have called attention.

Persons who have given thought to this matter have stated that each pupil requires about 1,500 cubic feet of air per hour for healthful breathing purposes. In the construction of all the school buildings in this city within the last two years, the school board has given the question of heating and ventilation special attention. The best systems of ventilation resulting from their investigations, and they were exceedingly thorough, have been placed in the buildings. The Fuller & Warren system of heating and ventilation, which has been placed in the Chapin school, furnishes each room with 88,200 cubic feet of air for each hour, 75,000 being the amount necessary for healthful respiration.

The Ludington building, heated by Boynton furnaces, as arranged by the architect, will give nearly the sufficient amount, and the Hess system of heating and ventilation adopted for the new high school building guarantees an amount much in excess of that actually required. To these buildings for their hygienic conditions we refer with pride. The remaining school buildings of the city are very deficient in respect to ventilation.

The Brown street school is heated by stoves, and in cold weather, with tight fitting storm windows, without any outside air inlets, furnishes no fresh air more than what at stated periods the teachers can allow to pass through the open doors or windows. The ordinary draught of the stove is far from being adequate, and the removal of air by the windows cannot be allowed as it causes draughts and reduces the temperature of the room. This building, it is expected, will soon be abandoned.

But the worst ventilated building of the city is the central school building which is at present occupied by over 400 pupils. It is heated by steam. The steam is brought into the room by pipes and the heat given out by radiators. There is no way by which fresh air can be allowed to enter except by doors and windows. For the drawing off of the foul air there are four small ventilators in two small air shafts which pass from cellar to attic, not projecting through the roof. If the air passed through these outlets at the rate of one cubic foot per second only one-third of the amount could possibly be removed. But as it actually is, these supposed air outlets are at times air inlets, giving to the rooms foul air from the class rooms or basement below. Allowing that these ventilators could remove one-third of the foul air, the two-thirds that remained, in one hour, would vitiate it to the extent of 10 parts of carbonic acid to 10,000 parts of air, which is considerably above the amount healthful for pupils to inhale.

From a lime water test of the air of the first primary room at 10 o'clock, Thursday morning, after 64 pupils had breathed the air for one hour, it was learned that there were 15 parts of carbonic acid to 10,000 parts of air. At this time the air seemed to be passing at a rapid rate through the ventilators. Consequently the pupils that attend this room are more than ordinarily exposed to malignant diseases, which should happen to break out in the school, and suffer more or less a deterioration of health and vigor.

It is estimated that 40 per cent of all fatal diseases are indirectly due to impure air, including the contagia of diseases.

In the outline of this paper we had intended to present and discuss other responsibilities of the board in the furnishing of further sanitary appliances, upon which the good health of the pupil greatly depends. Also it was our desire to call attention to hygienic conditions which become the duty of the parent and which the teacher or the school board cannot control; but time will not permit.

We summarize as follows:

Malignant diseases, appearing among children, where they assemble in large numbers at school, spread rapidly.

The greatest care should be taken by teachers and parents that no infected person attends school, to start the contagion.

The healthful growth and development of children and much of their future career and success in life depend upon the enforcement of hygienic laws by the teacher, the establishment of sanitary surroundings by the board of education, and the close coöperation of the parent. The principal of these are proper amount of mental work, developing and relaxative exercise, judicious arrangement of light, a sufficiently uniform temperature, and plenty of good air.

The sentiment of the people of Iron Mountain towards the observance of hygienic laws is increasing, and time we fully expect will bring about a good result.

A written address was given by O. Burlingame, civil and hydraulic engineer, Iron Mountain, which is as follows:

SEWERAGE AND DRAINAGE OF IRON MOUNTAIN.

BY O. BURLINGAME, CIVIL AND HYDRAULIC ENGINEER, IRON MOUNTAIN.

The subject of drainage and the disposal of sewage is an interesting one to me; but whether I shall succeed in making it interesting to this audience, remains a doubt in my mind.

It seems to me that many of the pertinent questions relating to this subject have already been raised, discussed, and settled the right way either by the citizens, the city council, or by the members of the State Board of Health. These questions are:

1. Is the city of Iron Mountain in need of a sewerage system to the extent that it will be justified in going to the necessary expense which is involved in such an undertaking?

2. The bearing that a sewer system has upon the health, comfort, and happiness of a community, and which has only been lightly touched upon.

3. Educating the people up to a proper use, or compelling its proper use by rules, regulations, and ordinances by the city council, and their rigid enforcement.

4. The main object of which is, the restriction and prevention of dangerous and communicable diseases, which I see will be the topic for discussion this evening.

As these subjects have been, or will be discussed from the standpoint of the lawyer, the physician, and the minister, I am driven, through fear of trespassing, to discuss the sewerage and drainage of Iron Mountain from the standpoint of an engineer.

We have no doubt but that every member of the State Board is familiar not only with the practical work of sewer building, but also understands and appreciates the extent and scope of the preliminary work of gathering and compiling data and preparing plans, etc., and I think the citizens of Iron Mountain from the age of three to one hundred are improving their opportunity to take object lessons from the work now going on. We have said that this is an interesting subject to us; there are many things occurring every day which tend to increase that interest and broaden one's knowledge of the subject.

We meet Mr. "A," who is critically inspecting the work (without salary), who says: "Mr. Burlingame, do you think these pipes are large enough?" The reply is generally a meek "Yes, sir;" but when it has been a day of more than usual interest we have been known to reply something like this: "No, sir; to tell you the honest truth, I don't think they are half large enough. We are just putting these in *for fun*. When we have had fun enough we will take them out and put in the proper size."

We pass on to the next gang to meet Mr. C. Mr. C. can hardly wait to say: "It's a fine day we are having; I suppose this weather suits you and you would like a month more of it?" "Yes; well say, Mr. Burlingame, don't you think these sewers are unnecessarily *large?*" We say: "No, I guess not."

Mr. C.: "Well now, they tell me that in London they had a six-foot sewer which was constantly filling up and they put inside of this six-foot sewer a twelve-inch pipe, and into this they dumped wheelbarrows of bricks, cats and dogs, horses and mules, and all just swept through that twelve-inch pipe and left it as clean as a whistle."

We have heard something about that London experiment before, minus the cats, dogs, horses and mules.

We asked Mr. C. if he knew the size of the pipe before him. He said: "No, not exactly; about fifteen or twenty inches." We: "No, it is twenty-four inches. Mr. C., do you know what the grade or fall is to that pipe?" "Why, no; it looks pretty near level to me." "Wrong again, it has five inches fall in one hundred feet. Now, Mr. C., you tell me that in your opinion that pipe is too large, can you tell me the carrying capacity of a pipe twenty-four inches in diameter with a fall of five inches to one hundred feet, and also tell me what size is required to carry off the sewerage, drainage, etc., for a given area." We have not discussed the subject with Mr. C. since.

PRELIMINARY WORK.

In devising a sewerage and drainage system for a given area, that area must be determined in acres with considerable accuracy, not only as a total but in its natural and topographical subdivisions, for the purpose of ascertaining the rainfall, an estimate of the future population, and determining the proper locations of the trunk sewers. Then a datum must be established and relative elevations taken and profiles made of all the streets, alleys, natural water courses, street grades, water tables of permanent buildings, etc., etc.

After these maps and profiles are prepared in a comprehensive manner, the work of adjusting grades and determining sizes is begun. Sometimes the grade for the sewer on a given street must be subordinate to the size, and upon others the size is subordinate to grade; that is, in laying the

grade for a sewer, you must not forget the main object: To give the abutting property holders the best possible service. The best service can be given when the sewer is not less than six feet below the street grade and nine feet below the water table of the buildings, and in order to do this it often becomes necessary to flatten the grades or reduce the inclination; but when it becomes necessary to reduce the inclination it also becomes necessary to increase the size or diameter of the sewer. These nice little adjustments are made, gone over and verified after the general scheme has been worked out.

The propositions constantly before the engineer are:

1. Given—the amount in gallons to be discharged every 24 hours, the grade of the sewer—to find the necessary size.

2. Given—the amount in gallons to be discharged, the size of the sewer—to find the inclination.

3. Given—the inclination and size—to find the discharge.

We have omitted in the formulas the element of length. When the pipes are long their length must be taken into consideration.

After the main sewers have been located, their size and grades determined, the work of laterals and branches is taken up and worked out on the same general principles. Then the location of man holes and lamp holes,—in modern practice lamp holes are seldom used; man holes are substituted. These are placed at all intersections, at all points in the change in the allignment, and at all changes of grades. Then follows an estimate of the cost, and, before actual construction begins, there comes the work of preparing the detail plans, specifications, and contract. This has become quite a formidable document.

We intended to exhibit a map showing the topography of the territory sewered and the location of sewers, etc., of Iron Mountain, but we could not find time to prepare one. We will outline the trunk lines, and those present who are familiar with the streets will be able to follow us:

Trunk Line No. 1.

Beginning at intersection of Smith and Norway, south on Norway to 4th, west on 4th to Stephenson, south on Stephenson to B, west on B to Carpenter, south on Carpenter to D, west on D to Kimberly, south on Kimberly to outlet.

No. 2.

Beginning at intersection of Ludington and Stephenson avenue, west on Stephenson avenue to Stockbridge, south on Stockbridge to Hewett, west on Hewett to Forest, south on Forest to C, east on C to Kimberly, south on Kimberly to D, where it intersects No. 1.

The sizes range from fifteen inches to thirty-six inches in diameter and are calculated to carry the sewage from a population of one hundred people per acre using sixty gallons of water each every twenty-four hours, also the subsoil drainage from swamps and the low basins, also the water pumped from the Ludington, Hamilton & Chapin mines, the mine water alone amounting in the aggregate to 2,800 gallons per minute.

The system of trunk sewers is so arranged that the mine water is introduced at the head of the system, lying in the lower portion of the city, taking the course of the lower contour at the foot of the hills, diluting all

sewage and flushing all sewers which have a grade of less than one per cent. Instead of describing the kind of pipe used, the manner of construction, etc., we will read from a copy of the printed specifications so much as pertains to that branch of the topic.

SPECIFICATIONS.

We have kind words and thanks to offer the Mayor, City Council and Sewer Commissioner thus far for their courteous, treatment and moral support during the progress of the work. We wish to emphasize this for it is something very unusual. A continuation of the past and present policy will certainly secure to Iron Mountain at least an honestly constructed and faithfully carried out sewerage and drainage system. This season's work will give Iron Mountain about five miles of sewers at a cost of $40,000.00.

DISCUSSION.

E. Everett discussed this paper only by questioning about the outlet for the city drainage.

The reply was that it was 60 feet beyond the city limits, at the source of the creek leading from Crystal Lake.

The following written address "Disposal of Waste and Excreta in Iron Mountain," by E. Meyer, M. D., Iron Mountain, was next in order:

DISPOSAL OF WASTE AND EXCRETA IN IRON MOUNTAIN.

BY E. MEYER, M. D., IRON MOUNTAIN.

In the economy of animal life, the effete material of the system not only appears not useful but positively harmful and deleterious, that, too, in proportion to the elevation in the scale of being. Waste material being harmful in itself, its bad effects are decidedly augmented by its natural subjection to various processes of decomposition within the body, consequently nature has made bountiful provision for the elimination of all effete and foreign material. Four main channels are to be found in the animal system through which waste is eliminated: First, the lungs, through which a most deadly and poisonous gas is exhaled; second, the skin, which, being as intimately associated with the deeper and underlying structures of the body as it is with the outer world, is especially adapted to carry off a large amount of waste; third, the kidneys; and fourth, the bowels, by which channels vast quantities of waste are disposed of.

By the gaseous effete material thrown out of the human system, the air becomes contaminated and absolutely unfit for the support of healthy animal life. To counteract the danger arising from this source, hygienic art has contrived appliances for ventilation; and hence we find that great importance is attached to supplying modern buildings with proper appliances for ventilation, hence the infrequency of disease traceable to this source.

With the more solid portions of waste material eliminated from the body it is different. They are not always so easily disposed of. To be sure, in large cities where we have access to a sewerage system, the danger

is reduced to a minimum, but in villages and towns where the much needed sanitary appliances are absent, it has and ever will baffle human ingenuity to dispose of excreta and waste properly and safely.

In not densely settled communities the privy can be built at a safe distance from the house and well. This, however, cannot be done in cities, consequently great danger arises therefrom. Here, as in other cities that have no sewerage, we have but two contrivances by which human excreta is disposed of,—one the ordinary privy vault and the other the so-called box or dry-earth system. The last-named system, when carried out as it ought to be, is certainly the better contrivance; but, on account of the care and attention required to keep it in order, it is rarely a success. As the general run of people are too negligent and careless, or consider it too much of an expense to keep it in good condition, it becomes a nuisance. When I entered on my duties as health officer I found, upon examination, the manner in which this system was carried out—nothing more than a public nuisance and a menace to public health. I found, as a general rule, a box two feet wide and four feet long, not even water tight, with liquid contents oozing out and producing a terrible stench; and even when water tight, instead of being cleaned out at least once in every two weeks, was allowed to accumulate for perhaps an entire year,—in other words, until the box was filled to overflowing. As we have no city paid scavenger, many people complain of their inability to hire local scavengers on account of the exorbitant prices charged for such work, and also for lack of time to remove the contents themselves. As to the privy vault I will say this, that a great many people build their vaults as near to the well as possible, against all reasoning. The danger that arises therefrom was thoroughly discussed last evening.

No privy vault without cemented bottom and sides should be allowed to be constructed in the city; even then it should be a safe distance from the well. These vaults should be thoroughly ventilated and as often as once a month during the hot season thoroughly disinfected with one or more of the following disinfectants: Chlorinated lime and soda, zinc chloride, copperas, crude carbolic acid, and bi-chloride mercury. These vaults should be emptied once a year at least, or better, twice.

But to avoid all the dangers of vaults there should be no vault at all. The excreta should be let fall on a shelf arranged under the seat of the privy and should be covered every day with dry earth, ashes or street-sweepings and taken entirely away as often as once in two weeks. In this way all offensive odors are avoided, as also all dangers of disease bred from the exhalations of putresence and the danger of water contamination from this source with its fearful consequences.

DISCUSSION OF DISPOSAL OF WASTE AND EXCRETA.

BY PROF. DELOS FALL, M. S., MEMBER OF THE STATE BOARD OF HEALTH, ALBION, MICH.

I feel as if some justification were needed for having come so far to take part in this convention. Our errand here may be stated in two phrases—the prevention of disease, and the saving of life. The city in which I live has been very rarely visited by typhoid fever, but there was a time when great anxiety was felt, when the prosperity of the whole city seemed to be on the verge of being greatly injured. The ingenious inven-

tor of many of the articles of manufacture, which manufacture lies at the bottom of very much of the prosperity of the city, was ill of typhoid fever. Could his life be saved Albion would prosper; should he die Albion would suffer. If this convention should result in the saving of a single life, and that life be as important to the welfare of Iron Mountain, as was this man to Albion, then it will well repay all the trouble and all the money which has been expended in carrying it on.

And I come to speak of one of the most important topics to be brought before this convention. I have been pleased with the thoughtful discussion of the subject, of the removal of waste and excreta to which we have just listened, and I desire to emphasize the same ideas but from a different standpoint.

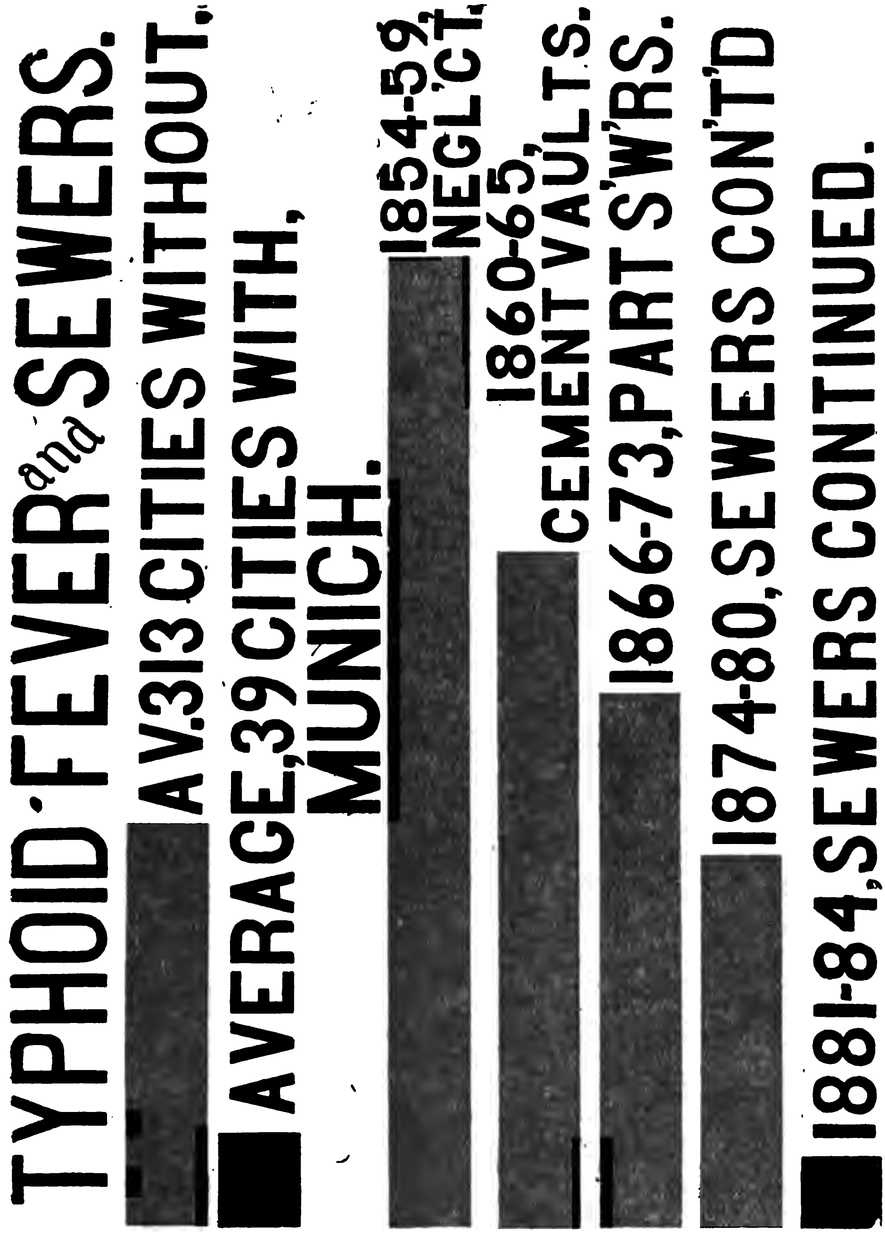
The most dangerous forms of waste are those which come from persons sick with communicable diseases. Take consumption for example; if the person suffering from this disease shall carelessly let fall upon the floor the material raised from the diseased lungs and air passages, it is only a matter of time when this material will have become dried and will be floating in the air to be inspired by every one who breathes the air of the house.

Such waste matters should be received into some convenient receptacle, such as oiled paper, or cloths of suitable size; and, at the first opportunity, cast into the fire and burned. These precautions taken and faithfully carried out by all consumptives, and the great white plague which now destroys one out of every eight of our population, will be destroyed off the face of the earth. The sanitarian believes that this can be done.

Take another disease—scarlet fever. The waste from this disease includes soiled clothing, napkins, dishes, food, etc., which have been in contact with the person suffering with the disease or contaminated by exposure to the air of the room in which the person sick with the disease is confined. Great care should be exercised that none of the articles so contaminated should leave the room until thoroughly disinfected.

In the case of typhoid fever especial care must be taken with the discharges from the bowels of the sick. Where carelessness prevails, and sanitary matters are entirely neglected, these human excretions are cast into that abomination of our age, that relic of barbarism, that plague spot —the privy vault. Here the disease germs find proper nourishment by which they are developed and reproduced in large numbers, and journeying out into the saturated soil in all directions, finally make their way into the well. I hope it may be made clear to the citizens of Iron Mountain how the abominable privy vault stands midway between the well water and the person infected with the disease, and that a sanitary necessity, serious in its nature, calls for the utter abolition of the earth-storage system. I am pleased to know that this city will be furnished with a complete system of sewerage. When that is ready for use, it is to be hoped that out of a due regard to the public health, every house in the city shall have sewer connections.

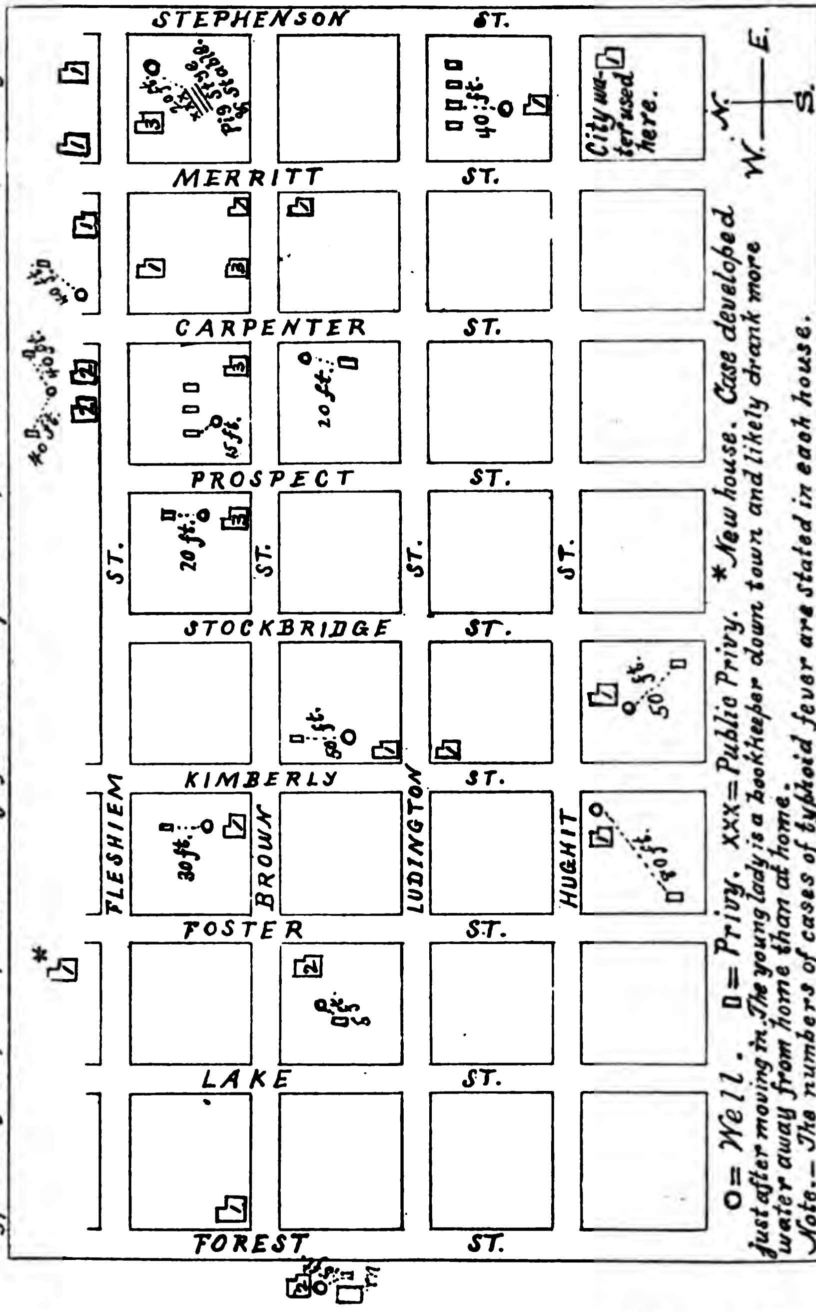
Since the organization of this city, many of the house lots have had several privy vaults, cesspools, and other holes, dug for the reception of sewage and other decayed matter. These vaults and cesspools have been used for years and, when full, are covered over with a thin layer of earth. The filling up of privy vaults with the fecal discharges, the removal of privies from one part of the house lot to another, and the scanty covering of earth over these privy vaults, cesspools, etc., all tend to contaminate the water supply.



Here is a diagram, accurately drawn to scale, "Typhoid Fever and Sewers."* In the lower half of the diagram, relative to Munich, Germany, the long black line shows the average annual death rate from typhoid fever, for the six years, 1854–9, when Munich was absolutely without sewers or any way to dispose of its waste and excreta, and its water supply was from

* The diagram "Typhoid Fever and Sewers," is printed on this page.

Typhoid fever, and proximity of wells to privies, in Iron Mountain, Michigan.



wells, the death rate from typhoid fever was at its maximum, 24.2 per 10,000 inhabitants. The second line, which is some shorter, represents the death rate (16.80), when the inhabitants were required to cement their privy vaults, and occasionally clean them out; and, with this slight change

for the better an annual saving of seven human lives per 10,000 inhabitants from death, from typhoid fever. The third line represents the death rate (13.30), when a portion of the city of Munich had adopted and were using a system of sewers; and you will see a great reduction in the number of deaths from typhoid fever. The fourth line shows a corresponding decrease in the death rate (9.26), when sewers were being constructed. The fifth and last line shows the remarkable change in the death rate (1.40) per 10,000 when the city was almost entirely under a system of sewerage, and had a good water supply. Today in the city of Munich, not 24, but a little more than one person to each 10,000 inhabitants die every year from typhoid fever, which is seventeen times less than it was before the system of sewerage and water supply was introduced. Though Munich has been growing, and becoming more densely inhabited during all these years, since the first move toward sewering the city, in 1859, the typhoid death rate has made a remarkable decrease.

In response to a request by Dr. Baker, Rev. J. M. Shank, pastor Central M. E. Church, Iron Mountain, explained a chart which he had prepared and which graphically represented one district in which typhoid fever has occurred, showing the relations of privy vaults to wells. The diagram, "Typhoid fever, and proximity of wells to privies, in Iron Mountain, Michigan, is printed on page 32.

The following is a brief synopsis of an unwritten address on "Public Health a Public Duty," by Rev. A. E. Cook, pastor Iron Mountain Baptist Church:

PUBLIC HEALTH A PUBLIC DUTY.

BY REV. A. E. COOK, PASTOR IRON MOUNTAIN BAPTIST CHURCH.

Health is the state or condition of soundness, wholeness and purity. Physical health is the condition of physical soundness, or freedom from physical pain or distress.

Public health is conceived to be that condition or state of the inhabitants of any given community in which the largest possible number are in the enjoyment of physical soundness.

The proposition set forth in our subject is briefly this: that to reach and maintain a condition of public health, as already defined, is the *duty*—not the privilege alone, but the bounden duty of the public.

The proposition is proved by the following considerations:

1. The public, and the public only, has power to perform certain things which are indispensable to the highest conditions of public health.

Admitting for the moment that "the public" embraces the whole state, we find that our legislators have expressed their recognition of this principle by the passage of laws regulating the sale of powerful drugs whose wise use is undoubtedly beneficial but whose indiscriminate and unregulated use would be as undoubtedly deleterious. In the passage of laws for the drainage and reclamation of swamp lands, which, permitted to remain in their natural state, give rise to malarial affections through pollution of the atmosphere we breathe; by the passage of laws prohibiting the sale of kerosene oil for illuminating purposes which does not come up to the certain standard of purity named in the statute; and by the passage of many other laws which might be cited. It is self-evident that such things as these could not be accomplished by individuals nor by isolated small com-

munities, and that the results aimed at can only be attained by the State at large acting through its accredited authorities.

Limiting "the public" to the city or village, we find the same conditions confronting us.

The construction of a system of sewerage, an adequate supply of pure water for culinary and cleansing purposes; the proper disposal of the waste and excreta which, allowed to accumulate, burden the water in our wells and the air we breathe with the germs of death-dealing disorders; the fixing of limits within which highly combustible buildings shall not be erected; the proper provision for escape from public buildings in case of fire; and the sufficient isolation of electric wires, are some of the things manifestly beyond the reach or the willingness of the individual and as manifestly conducive to public health.

2. Public health is a public duty because it is a public benefit.

Each adult engaged in any productive industry has a pecuniary value to the community. The loss of such persons through the agency of preventable disease is a loss not only to the immediate relatives, but also to the public. The city or village, like its individual citizens, is helped or hindered by the reputation it bears; and it is well known that a reputation for unhealthfulness lodged against a city is a most serious incubus upon its growth.

Again the public is benefited by the highest conditions of health, through the laws of natural heredity. "Like father like son," applies in a very perceptible degree to our physical status, and it is an indisputable fact that the good health of the present generation means the better health of the next.

3. Public health is a public duty, because the public alone has the power to compel.

It has been said that every sin against righteousness and God has for its root and center some form of human selfishness. Whether that be true or not in every particular, it is undeniable that many of the sins against public health have for their starting point the selfish cupidity or avarice of individuals. There is a large class of people even in this day of enlightenment who are unacquainted with the fundamental sanitary laws. These should be patiently instructed and helped into a higher knowledge and a better mode of life. But there is another class found in greater or lesser numbers in every community with sufficient knowledge to be of material assistance to their neighbors and the general public, but who can be rooted out of their complacent selfishness and transformed into complaisant citizens by nothing short of the strong arm of the law.

4. Public health is a conservator of public morals and therefore a public duty.

We do not think the oft quoted adage "Cleanliness is next to godliness" can be found in just that form in the Bible, but we have no doubt of the godlikeness of the truth it expresses.

Extreme poverty, even in this land of plenty, is, no doubt, sometimes unavoidable and therefore excusable; but when squalor, filth and dirt are permitted to reign supreme upon the person and about the home, it is too evident that self-respect, which is the basis of all right character, has taken its flight.

These are among the considerations which induce belief in the truth of the proposition that "Public Health *is* a Public Duty."

Rev. J. P. Rosquist, pastor Swedish Baptist church of Iron Mountain, discussed the subject "Public Health a Public Duty;" but, as he was afterwards unable to reproduce his remarks, the discussion is omitted from this pamphlet.

Fourth Session, Saturday, Oct. 31, at 7:30 p. m.

Hon. M. J. Doyle, Vice President, took the chair in the absence of President Crowell. After music by the chorus, same as last evening, Rev. A. R. Williams, pastor First M. E. Church, gave an unwritten address on the "Restrictioon and Prevention of Dangerous Communicable Diseases grom the Standpoint of a Minister," which was not afterwards reproduced and is, therefore, necessarily omitted from this pubication.

Hon. M. J. Doyle, attorney, gave a written address "Restriction and Prevention of the Dangerous Communicable Diseases from the Standpoint of a Lawyer," which is as follows:

RESTRICTION AND PREVENTION OF DANGEROUS COMMUNICABLE DISEASES FROM THE STANDPOINT OF A LAWYER.

BY HON. M. J. DOYLE, ATTORNEY, IRON MOUNTAIN.

The salutary effects of a proper sanitary system, upon the morals and health of the community are none the less appreciated by the legal mind; although from the force of education and practice, it first seeks the nature of the rights involved and inquires how their violation may be redressed. The lawyer contemplates the subject as a cold, hard question of right and wrong, injury and remedy.

The committee has kindly invited me to present to the Convention a few thoughts upon the subject of the restriction of dangerous communicable diseases from the standpoint, particularly of the advocate of justice.

The moments which I have been able to snatch from my professional appointments have been very few—so few, that had it not been for the kindly admonition that only brief papers were calculated for, I would hardly have dared to appear where I now stand.

How then, does this subject impress the legal mind? When the revolutionary fathers flung from the limbs of the scattered Colonies of New England, the shackles forged in the halls of Westminister by the hands of tyranny, they established upon this continent, at all events, thence for all time to endure this crowning humanitarian principle, that all men had an unalienable right to life, liberty and the pursuit of happiness. Upon this broad and solid rock rests the grand fabric of our National glory. It is the right therefore, indisputable and unalienable of every city of the United States to demand from the constituted authority, protection in the enjoyment of all their rights—protection from every form of communicable and dangerous disease.

Our lives, our liberties, our pursuit of happiness all are interrupted and imperiled in the absence of due sanitary regulations or their lax enforcement when incorporated into our general law.

The air we breathe, the water we drink, the houses wherein our days and nights are spent, the companions with whom society associates us, when bearing the poison of communicable disease cease to be messengers of rest, comfort and pleasure. Their approach is to be dreaded; they become harbingers of death, no less remorseless than the grim breath of the cannon or the sabre's piercing thrust. The scorching breath of the fever stricken patient, the foul exhalation from the chamber of disease, the stagnant pool with its green film of death, food carrying destruction to its hapless victims, ill sewerage or drainage insidiously undermining the strongest constitution, all, every one, menace the rights of the citizens and are species of treason against the sovereign power of the State, which the

strong arm of municipal government should promptly and vigorously repress.

Life burdened with disease, liberty curtailed with the disordered system, the pursuit of happiness amid the dangers of scarlet fever, typhoid and diphtheria,—such conditions utterly fail to sustain the prime purpose of society. The citizen, then I repeat, is entitled to exact from the hand in which the sceptre of authority has been placed, the fullest measure of relief from every form of dangerous communicable disease. To insure such blessings, as well as security in the enjoyment of property rights, the extraordinary police power and the endowment of taxing authority remain vested, in the government. He "who steals my purse" says Shakespeare, "steals trash," "but he that filches from me my good name, robs me of that, which not enriches him, and makes me poor indeed."

The deprivation of pecuniary means is incomparable with the loss of health, the sacrifice of life. It is the right of the citizen to exact—it is the duty of the government to secure absolute freedom for all the people from the marauding and devastating approach of disease, dangerous and communicable.

It has been a gratifying observation to notice the progressive steps our own State of Michigan has made from time to time, although much remains undone to perfect our sanitary system. Personally, I am proud of my connection with the Legislature that marked a most emphatic movement in this direction. Act No. 15 of the Public Acts of 1891, has therein incorporated a very commendable effort to prevent the spread of disease. Our local municipalities should keep abreast of the general trend of sanitary thought. Able and fearless health officers to execute the ordinances of State and city should be appointed and their measure of compensation should be consistent with the vast importance of the work they have been assigned. Eternal vigilance is the price of liberty and to complete the work of the State authorities, this is imperatively needed.

Constant, sleepless, vigilant sentinelship maintained against this arch enemy of the race, will eventually triumph. With clean, healthful cities and villages, security from the ravages of disease, the native loyalty of our people will be well advanced and fuller means provided to resist the economic and political dangers that, from the womb of time come forth to battle and oppose the aspiring hopes of the unrivaled Republic of the West.

Henry B. Baker, M. D., Secretary of the State Board of Health, Lansing, gave a written address on "The Restriction and Prevention of the Dangerous Communicable Diseases," which is as follows:

THE RESTRICTION AND PREVENTION OF DANGEROUS DISEASES.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICHIGAN.

Mr. President, Ladies and Gentlemen:—One of the first questions suggested by the subject assigned to me is, what diseases can be restricted or prevented? So far as relates to the class of diseases the answer is easy, —the diseases which can be restricted are those which are *communicable*. The "communicable" diseases include those which are contagious, those which are infectious, those which in any way are communicated or spread from one person to another,—such diseases as small-pox, scarlet fever, diphtheria, measles and whooping-cough.

Then an important question is, whether any of the most dangerous diseases which have not heretofore been considered communicable do really belong to that class, and can, therefore, be restricted or prevented. To this question we can now answer yes. At least one of the most dangerous of all diseases, namely, consumption, has, in recent years, been found to be a communicable disease, and a preventable disease.

There is considerable evidence now tending to prove that pneumonia is a communicable disease, and that probably many deaths from that disease could be prevented by the general adoption of measures which recent investigations have revealed.

THE IMPORTANCE OF THIS SUBJECT.

The importance of the subject of the restriction of the dangerous diseases cannot easily be estimated. Let us see what aid the vital statistics can give us. The statistics of deaths in Michigan are not perfect, but the relative importance of the several diseases is probably shown with approximate accuracy. The diagram* which I exhibit, "Deaths in Michigan, 1876–87," and copies of which are distributed in this audience, is accurately drawn to scale and correctly represents the deaths reported to the Secretary of State. This diagram shows the relative importance of the several dangerous communicable diseases. It shows that in Michigan every one of the diseases named in the diagram is much more important than small-pox, as a cause of deaths, and that when compared with diphtheria and especially when compared with consumption; small-pox is insignificant, or at least that it was so during the twelve years 1876–87. If the diagram included pneumonia that disease would appear between "diphtheria" and "typhoid fever," and then the five diseases which cause most deaths in Michigan would be shown in the diagram. The five diseases which cause most deaths in Michigan, named in the order of their importance, are: Consumption, diphtheria, pneumonia, typhoid fever, and scarlet fever.

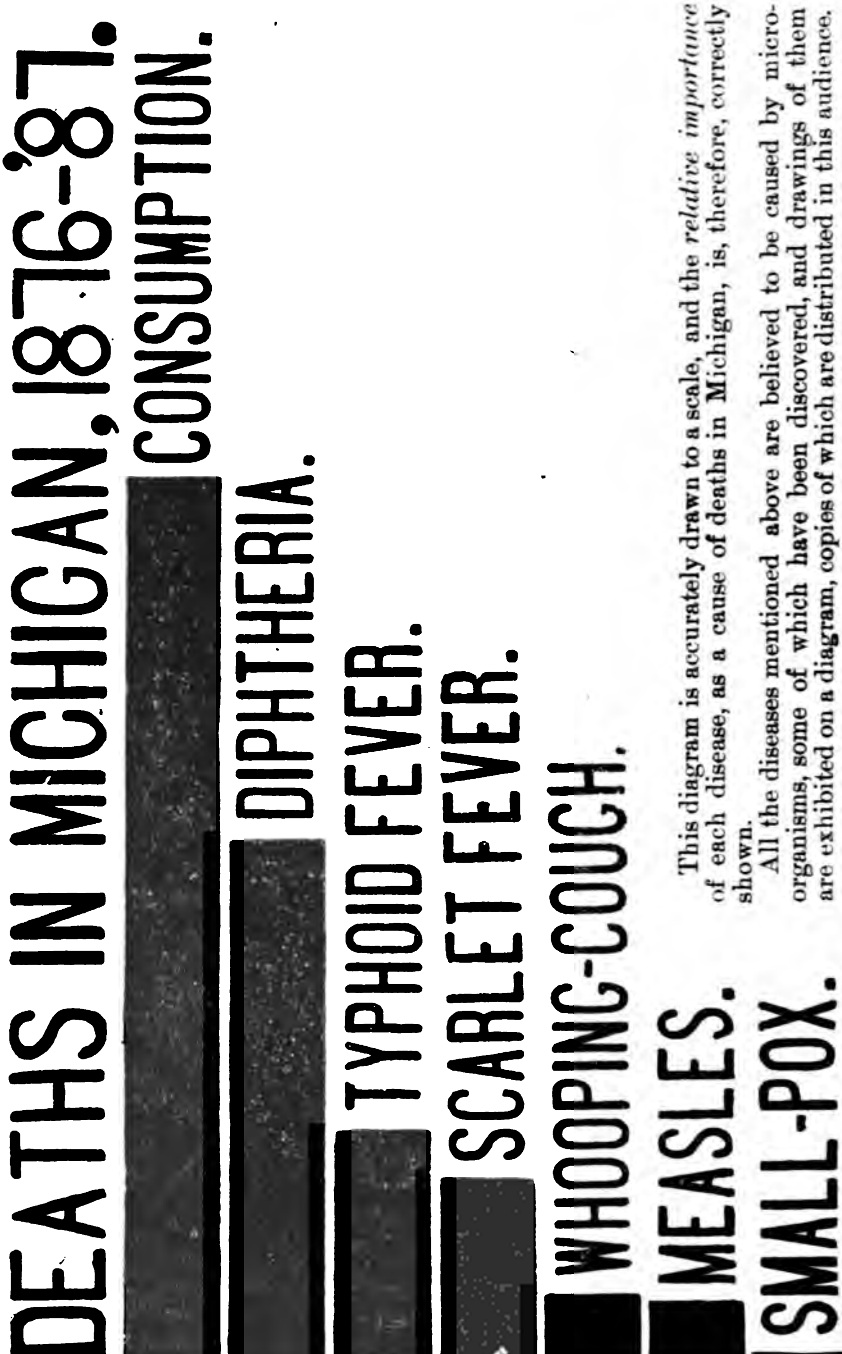
We thus gain some idea of the vast importance of this subject,—the restriction and prevention of the dangerous communicable diseases, which include all the most important causes of deaths in Michigan. Especially do we appreciate the importance of this subject when we consider that we absolutely know that a large proportion of the cases and deaths from the most of these diseases are *preventable*, and I believe that this is true of all of these diseases.

COÖPERATION NECESSARY FOR THE RESTRICTION OF DISEASES.

For their prevention, however, it is necessary that all the people shall coöperate. No one can fully protect himself so long as others do not understand the subject and act accordingly. Therefore, the only way these most important causes of death can be most completely avoided by any of us, is by increasing the proportion of the people who know how to restrict and prevent them. If we except small-pox, which may by vaccination be avoided by each person for himself, this statement is true relative to each of the dangerous communicable diseases,—for the restriction of each there is required general diffusion of knowledge, and general coöperation of all classes of people. That is a good reason why "the restriction

---

* The diagram "Deaths in Michigan, 1876-87," is printed on page 38.



This diagram is accurately drawn to a scale, and the *relative importance* of each disease, as a cause of deaths in Michigan, is, therefore, correctly shown.

All the diseases mentioned above are believed to be caused by micro-organisms, some of which have been discovered, and drawings of them are exhibited on a diagram, copies of which are distributed in this audience.

and prevention of the dangerous diseases" is given so prominent a place **on the program of every sanitary convention.**

HOW THESE DISEASES ARE SPREAD.

But these diseases are not all spread in the same way, and it is necessary that the people generally shall know how each one is spread, in order to know how to restrict each disease. In each disease, something goes, from a sick person, which is capable of causing the disease. It goes from that part of the body in which the disease is located, and generally it thrives best when it reaches that same part, of the body to which it goes. In consumption that part is generally the lungs; and the specific cause of consumption goes out with the sputa, and is scattered about not only wherever the moist sputa go, but also wherever the dust from the dried sputa goes. And, as the dust of the air is breathed in with the air inhaled, there is opportunity for the specific cause of consumption to go at once to the part of the body in which it is usually found.

This indicates what is the most important measure for the restriction of consumption,—namely, the *destruction or disinfection of all sputa from every consumptive person.*

TYPHOID FEVER.

Typhoid fever causes about ten times as many deaths in Michigan as does small-pox, probably about one thousand deaths per year, and most of these deaths should be prevented. The greatest number of deaths from typhoid fever is of persons in the prime of life, and this should prompt to greater efforts for the prevention of this disease.

The most common modes of spread of typhoid fever are not the same as of small-pox and consumption, consequently the measures for its restriction and prevention are not the same. The pamphlets on this subject issued by the State Board of Health, and freely distributed here, contain plain directions how to prevent typhoid fever, and how to restrict its spread. It is now believed that typhoid fever is most frequently spread by means of the drinking water, that the microscopic cause of the disease is probably reproduced in the bodies of persons who have the disease, and that this specific cause gains access to the drinking water by filtering through the soil, and sometimes by being washed into wells or streams from which the drinking water is drawn. The noted instance at Lausanne, Switzerland, where the discharges from typhoid fever patients were thrown into a small stream, which disappeared by sinking into the earth and gravel, and reappeared about half a mile distant as a mountain spring, the clear water of which caused typhoid fever in 144 persons, is instructive, and is useful for us to hold in mind as illustrative of how the disease may be spread. The most usual mode of spread is probably by way of the privy vault and the neighboring well. The facts concerning the outbreak at Lausanne prove (and the same has been indicated in other instances) that the cause of typhoid fever sometimes passes great distances by way of the underground water flowing through strata of gravel. We must not forget, however, that typhoid fever may be spread through the air, that the supposed "germ" of the disease is not destroyed by once freezing, and is not yet known to be destroyed by ordinary drying. We know that the microscopic "germ" of consumption is most dangerous when dried and floating in the air we breathe. It may be that the specific cause of typhoid fever is dangerous in the same way.

The prevention and restriction of typhoid fever requires the disinfection

of all bowel discharges from those sick with such disease, and constant watchfulness of the sources of supply of water for drinking and culinary purposes. All water from a suspected source should be boiled before its use. Numerous instances are reported where typhoid fever has been spread by the rinsing of milk cans with water apparently pure, but really infected with the germs of typhoid fever, capable of infecting the milk. This teaches us the importance of having water free from typhoid infection for all household purposes.

But the general water-supply of cities and villages is a matter of the greatest concern, and it should be procured from places where there can be no probability of immediate or remote contamination. The well-known outbreak of typhoid fever at Plymouth, Pa., where over a thousand cases and 114 deaths occurred, is apparently an illustration of how great a calamity may follow the fouling of a *general* water-supply by the specific cause of typhoid fever.

There is not time at my disposal to give all the evidence proving the enormous saving of human life from the ravages of typhoid fever, which in recent years has been accomplished because of such knowledge as this to which I have just alluded; but I wish briefly to refer to some of this evidence. In a pamphlet published by the Michigan State Board of Health, and entitled "The Influence of Sewerage and Water-Supply on the Death-Rate in Cities," Mr. Irwin F. Smith, shows conclusively very great reductions in the mortality from typhoid fever in many of the great cities in this country and in foreign countries, the reductions in the typhoid mortality following the introduction of systems of sewerage and general water-supplies. For instance, in the city of Munich the death-rate from typhoid fever in the period from 1854 to 1859 was 24.2 per 10,000 inhabitants, while in 1884 it had declined to 1.4 per 10,000 inhabitants; that is, before the city was sewered, and while it was supplied with water from wells, the mortality from typhoid fever was about seventeen times as great as it was after the city was well sewered and had a good general water-supply.

If there should be in Michigan such a reduction of the mortality from typhoid fever as was secured in Munich through better sewerage and water-supply, there would be a saving of over nine hundred lives per year, and over nine thousand cases of sickness per year. To point out how such favorable conditions for healthful existence may be secured, is one of the objects of such sanitary conventions as this.

Let us pass now to the consideration of diseases which are fatal chiefly to children.

DIPHTHERIA.

About eighty-five per cent of all the deaths from diphtheria are of children under ten years of age. Grown people have diphtheria, but it is usually considered as an ordinary sore throat, and proper precautions to prevent the spread of the disease are not taken. This ought to be generally known, and many more lives can be saved when all our people come to understand the facts.

In Michigan diphtheria causes about seventeen times as many deaths as small-pox does. Diphtheria is prevented by keeping away from where the disease is, and from everybody and everything that has been near the disease, keeping away until everything has been disinfected. In order that

this shall be possible it is essential that every place where diphtheria is shall be promptly reported to the health officer, and plainly placarded. The law requires the local board of health to "give public notice of infected places," and to "use all possible care to prevent the spreading of the infection." Another law requires the health officer to "give public notice of infected places by placard on the premises, and otherwise if necessary." Common humanity requires of every person that he do his utmost to fulfill the letter and spirit of all such laws for the public safety against such a terrible disease as diphtheria.

But however good the laws may be, their execution depends upon the enlightened public sentiment of the locality, upon the people themselves, from whom the prompt notice should go to the local health officer, and upon intelligent and faithful local officers who should perform duties which are of the highest importance to the people. For obvious reasons, the compensation of the health officer should be greater than he can obtain for the same time by the regular practice of his profession as a physician,—the highest interests of the public demand that he shall have a greater money interest in the prevention of sickness than in the treatment of sickness which should have been prevented.

SCARLET FEVER.

Scarlet fever is a disease to be dreaded on account of the mortality which it causes, and also on account of the permanent injuries which result from it. Thus, as an instance, of 263 pupils in the Michigan State School for the Deaf, at Flint, during the years 1887-8, who became deaf since their births, the loss of hearing of 16 per cent, is attributed to scarlet fever.* Of the 114 pupils in the Michigan State School for the Blind, at Lansing, during the two years 1887-8, who became blind since birth, 6.1 per cent lost their sight from the effects of scarlet fever.†

In Michigan, scarlet fever causes about nine times as many deaths as small-pox does. The only *preventive* is to keep away from the disease, and to allow no person or article infected with the scarlet fever contagium to come near a person susceptible to that disease.

For its restriction, except that there is no vaccination, all the measures proper in the case of small-pox are proper in scarlet fever.

Inasmuch as scarlet fever causes nine times as many deaths as small-pox does, the importance of prompt notice to the health officer is at least nine times as great as it is in small-pox.

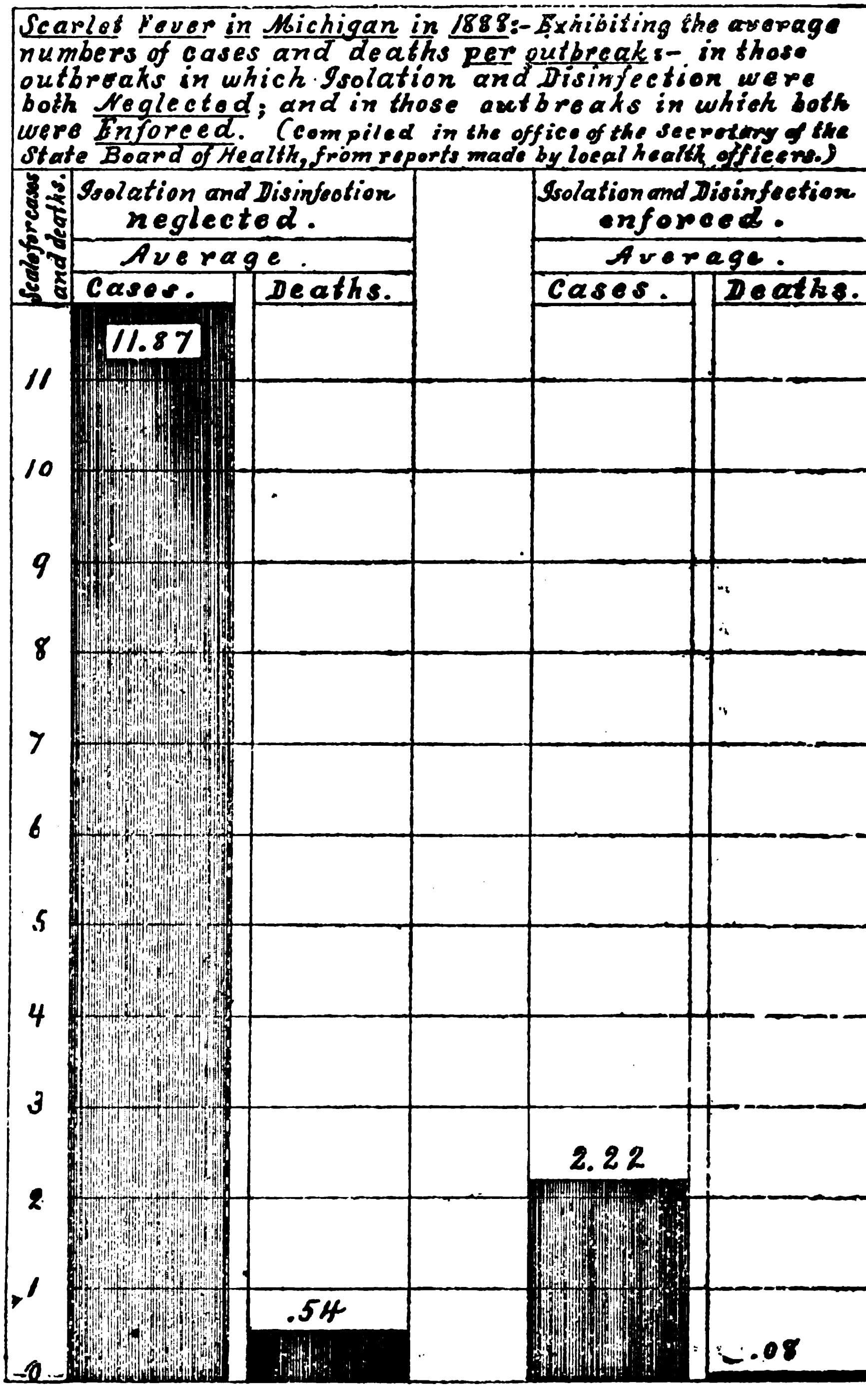
All the other measures should be promptly and thoroughly executed. I will not stop to give you details. They are published in our pamphlets, here for distribution.

PRACTICAL RESULTS IN RESTRICTING SCARLET FEVER.

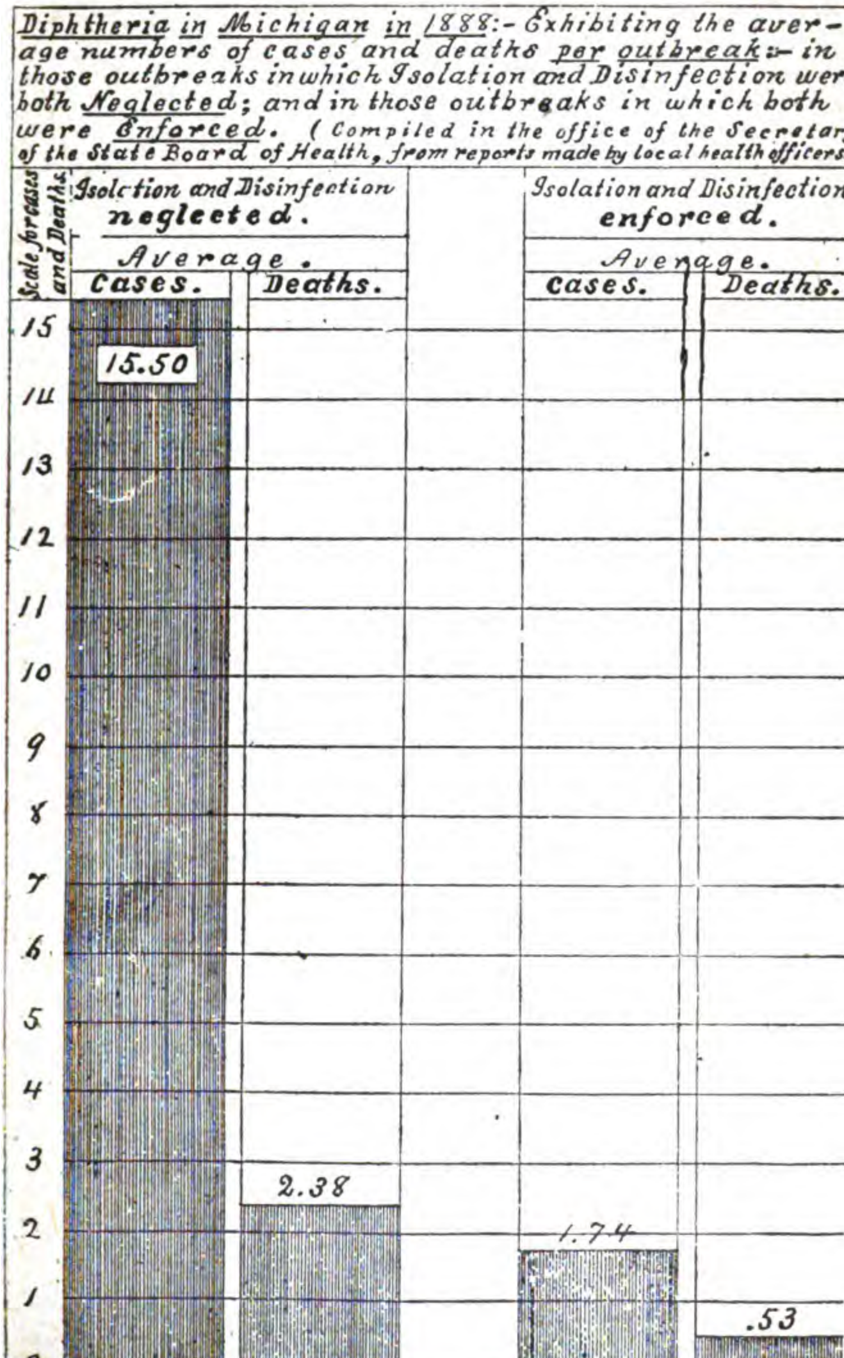
At the close of the year 1887, the statistics published by the State Department, showed that the mortality from scarlet fever in Michigan had been reduced in the years when the measures recommended by the State Board of Health had been to some extent fulfilled, so that over five thousand six hundred persons had lived who under the old mortality rate, before the Board began its work, would have prematurely died. This is an aver-

* Eighteenth biennial report of the Board of Trustees of the Michigan School for the Deaf.
† Report of the Superintendent of Public Instruction, Michigan, 1888, pages 78-80.

ISOLATION AND DISINFECTION RESTRICT SCARLET FEVER.



ISOLATION AND DISINFECTION RESTRICT DIPHTHERIA.



age saving of four hundred lives per year—rather more than a life every day for fourteen years—saved from that dread disease, scarlet fever.

But we have other evidence than the mortality statistics, showing the great saving of life which it is possible to have in Michigan through such measures for the restriction of scarlet fever as I have briefly outlined. The experience of the local health officers in restricting scarlet fever in this State is reported each year to the State Board of Health; and a compilation of these reports shows that in those outbreaks in which isolation and disinfection were neglected there were about five times as many cases and about five times as many deaths as in those outbreaks in which they were enforced.*

This is about equivalent to saying that four-fifths of the cases and deaths from scarlet fever are known to be preventable through measures which we can describe in three words—*isolation and disinfection.*

PRACTICAL RESULTS IN RESTRICTING DIPHTHERIA.

While on the subject of the saving of life in Michigan, I may mention that the experience of the health officers in restricting diphtheria in this State is also reported each year to the State Board of Health, and a compilation of these reports shows that 833 lives were saved and 4,374 cases of sickness prevented from diphtheria in Michigan during the year 1886, and that in the year 1887, 518 lives were saved and 2,371 cases of sickness prevented; during 1888, 416 lives were saved and 3,292 cases prevented. Thus during the three years 1886, '87 and '88, over ten thousand (10,037) cases of sickness were prevented, and more than seventeen hundred (1,767) lives were saved from diphtheria in Michigan. Or, another way of stating this is to say that during the last three years the *known* saving of life in Michigan from diphtheria has averaged one and a half persons per day.†

PRACTICAL RESULTS IN RESTRICTING SMALL-POX.

The statistics collected and published by the Secretary of State of Michigan, taken in connection with the facts on record in the office of the State Board of Health, prove that in Michigan, through such measures as I have outlined, the mortality from small-pox has been reduced, and that if it had continued at the same rate as before the State Board of Health was established, more than one thousand five hundred persons in Michigan would have died from small-pox that have not died of that disease. This was true at the end of the year 1887, and since that time the mortality from small-pox in Michigan has not increased. The statistics now cover so many years that we think there can be no doubt of the reliability of their evidence.

The success which has already been achieved in dealing with scarlet fever, diphtheria, and small-pox should encourage all to more thoroughly

*The evidence for one year, 1888, is shown in the diagrams distributed here, and printed on pages 42-3.

†You may be interested to know the method of estimating the number of cases prevented and lives saved by means of isolation and disinfection. It is as follows: Multiply the whole number of outbreaks by the average number of cases and deaths in the neglected outbreaks, and the product is the probable number of cases or deaths which would have occurred if all outbreaks had been neglected. Deduct from this the number of cases or deaths which actually occurred, and the remainder is the indicated number of cases of sickness prevented or lives saved by the efforts made to restrict the disease.

As the local health officers report to the State Board of Health the numbers of cases and deaths in outbreaks of diphtheria, and also report just what was done (in each outbreak) to restrict the disease, we are thus supplied with the data necessary to learn the success which attends any line of action which is taken. The diagram on page 43, "Isolation and Disinfection Restrict Diphtheria," copies of which are distributed here, exhibits graphically the experience in restricting diphtheria in Michigan in 1888.

coöperate for the restriction of those diseases, and also to enter vigorously upon the work of restricting typhoid fever and consumption. The relative importance of these diseases can be seen by the diagram which is exhibited here, "Deaths in Michigan, 1876–87."* I believe that one hundred lives per year have been saved from death from small-pox. The diagram is accurately drawn, to scale, and correctly represents the relative mortality in Michigan from these important diseases, which we believe are largely preventable. You can see for yourselves how much more important than small-pox some of the diseases are, and the tremendous opportunity which there is for life-saving work for the restriction and prevention of the dangerous communicable diseases in Michigan. I do not see how one can have a better field or a nobler work, and I trust we shall all do what we can in this direction.

Dr. Baker, on behalf of the State Board of Health, spoke briefly, expressing high appreciation of the interest taken in the public health by the citizens of Iron Mountain, as evidenced by their attendance on the meetings of this convention, and by the movements for better sewerage, etc., in the city. He hoped the interest and work would continue, and that at some future time the State Board of Health could visit Iron Mountain as an attractive summer health resort.

RESOLUTIONS ADOPTED.

Dr. S. J. Gareau offered the following resolution:—

Resolved, That it is the sense of this convention that the health officer, if faithful, should be better paid.

Rev. S. R. Williams offered the following resolution:—

Resolved, That the convention express its sincere thanks and gratitude to the State Board of Health for the pains, care and toil manifested by its members in behalf of the health of the Iron Mountain people.

Both the resolutions were declared adopted.

In closing the convention, Hon. M. J. Doyle spoke briefly, recalling the fact that the recent legislature, (of which he had the honor to be a member,) had passed a law to prevent the spread of dangerous communicable diseases; also expressing his appreciation of the work of the State Board of Health, and of the good results likely to follow the papers and discussions during the several meetings of this convention.

* The diagram "Deaths in Michigan, 1876–87," will be found on page 38.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

HOLLAND, MICHIGAN,

MARCH 3 AND 4, 1892.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF HOLLAND.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1892.]

[No. 367.]

MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
ROBERT SMITH & Co., STATE PRINTERS AND BINDERS.
1892.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

HOLLAND, MARCH 3 AND 4, 1892.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH,
FOR THE YEAR 1892.

[No. 367.]

Robert Smith & Co., State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

HOLLAND SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT HOLLAND, MICH.

THE THIRTY-SEVENTH SANITARY CONVENTION, UNDER THE AUSPICES OF THE MICHIGAN STATE BOARD OF HEALTH,

MARCH 3 AND 4, 1892.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR 1892.

This convention was held under the direction of a committee of citizens acting with a committee from the State Board of Health.

The following persons constituted the various committees:—

Committee from the State Board of health.—Henry B. Baker, M. D., Lansing.

Local Committee.—O. E. Yates, M. D., Chairman, Rev. J. T. Bergen, Rev. H. E. Dosker, Rev. E. Bos, Prof. G. J. Kollen, I. Verwey, W. Benjaminse, Dr. J. A. Mabbs, Dr. H. Kremers, P. H. McBride, Hon. G. J. Diekema, R. H. Habermann, George P. Hummer, G. W. Mokma, I. Cappon, W. H. Beach, C. J. DeRoo, R. Kanters and E. J. Harrington.

Executive Committee.—W. H. Beach, Chairman, C. J. DeRoo, Dr. F. J. Schouten, R. H. Habermann, Dr. Henry B. Baker.

Reception Committee.—O. E. Yates, M. D., Hon. G. J. Diekema, P. H. McBride.

Music Committee.—Prof. J. B. Nykerk.

The officers of the convention were:—

President.—Dr. O. E. Yates, mayor of the city.

Vice-Presidents.—Prof. G. J. Kollen, Holland; Hon. C. VanLoo, Zeeland; Hon. H. F. Thomas, M. D., Allegan; A. Vanderveen, M. D., Grand Haven; Byron B. Godfrey, M. D., Hudsonville; W. Diekema, Holland township; J. W. Norrington, West Olive.

Secretary.—G. VanSchelven, Holland, Michigan.

The following named persons were in attendance at some of the sessions of the Sanitary Convention:—O. E. Yates, M. D., mayor of the city of Holland; Prof. G. J. Kollen; Byron B. Godfrey, M. D., Hudsonville; W. Diekema, Holland township; G. VanSchelven; Drs. Henry Kremers, F. J. Schouten, J. A. Mabbs, of Holland, J. D. Wetmore, W. C. Ransom, South Haven, W. E. Visscher, New Zeeland, William Vanderberg, New Zealand, H. Boss, Fillmore Center, H. Fortuin, Overisel, Oscar Baert, Zeeland, Carl Baert, Zeeland, E. D. Spelder, Drenthe, Hon. G. J. Diekema, Prof. J. B. Nykerk, Prof. Charles Scott, D. D., Ph. D., president of Hope college, Holland; Hon. John Avery, M. D., president of the State Board of Health, Greenville; Arthur Hazlewood, M. D., member of the State Board of

Health, Grand Rapids; Victor C. Vaughan, M. D., member of the State Board of Health, Ann Arbor; Prof. Delos Fall, M. S., member of the State Board of Health, Albion; Hon. Frank Wells, member of the State Board of Health, Lansing; Henry B. Baker, M. D., secretary of the State Board of Health, Lansing.

FIRST SESSION, THURSDAY, MARCH 3, AT 2:30 P. M.

The convention was called to order by the president, Dr. O. E. Yates. After a musical selection by the Holland Double Quartette—Mrs. G. J. Diekema, Mrs. J. H. Gillespie, Mrs. A. Van Raalte, Miss True Alcott, Messrs. P. Soulen, H. Broek, and Prof. J. B. Nykerk, with Miss Boone, accompanist,—and prayer by the Rev. H. E. Dosker, O. E. Yates, M. D., Mayor of the city gave the following address of welcome:—

ADDRESS OF WELCOME.

BY O. E. YATES, M. D., MAYOR OF THE CITY.

Gentlemen of the State Board of Health and Friends:—

Here at the threshold of this convention, which we believe is to be of great public benefit to our community, I desire to tender to the members of the State Board of Health and to all visiting friends a most hearty welcome to our city. I do this not only in my official capacity, but also in my professional and private character.

A few of the members of this beneficial State organization came among us a few months since, when we were overshadowed by a malignant disease, which, obeying its mysterious laws, had become epidemic, and, by their counsel and thorough knowledge, greatly aided in disseminating among the people much needed information, thus sustaining the officials and encouraging the medical profession in their efforts to prevent the spread of the contagion.

For this kind and neighborly act I desire at this my first opportunity to most heartily thank them. Our obligation is especially great to the gentlemen who left home and business to assist us and we thank the entire board for permitting the visit.

Gentlemen, we in Holland believe in a State Board of Health. A Board organized to disseminate knowledge, to collect and preserve statistics, to make yearly record of the public health, thus aiding the people in their efforts to restrict disease and preserve health without which other conditions of life can contribute but little to the great end sought by all, viz., happiness.

The boundless freedom to which the American citizen is heir, makes him restless under restraint, and too often heedless of advice. That which savors of paternalism in government he derides, that which increases taxation he objurgates, but neither the necessity nor benefits of your organization can be disproven. The comparatively insignificant sum expended in your interests out of the boundless resources of our great commonwealth is money well invested. Would that all the sums disbursed by our legislators could be traced to equally pure and important results.

If those who hint at suspending the functions of our Board of Health have economy as their aim, then let some of the junkets to state institutions

be omitted, let the embryo statesmen who find it so difficult to remain away from the bosoms of their families over Sunday stick to their posts and shorten the legislative sessions, and with the money thus saved increase the efficiency of those institutions having for their aim the health, prosperity and resulting happiness of the masses of the people,—that great body from which our pseudo-statesmen sprang and to which they will soon return.

Once more I bid you a cordial welcome to our city. I know our citizens will maintain their well earned reputation for hospitality, and I only need to warn you gentlemen against the dangers of indigestion which too often lurk under cover of that potent word.

RESPONSE AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY HON. JOHN. AVERY, M. D., OF GREENVILLE, PRESIDENT OF THE STATE BOARD OF HEALTH.

The kind and complimentary remarks of your mayor are highly appreciated by members of the State Board of Health, as they indicate that the value of the work in which the Board is engaged is understood and prized by your authorities. They also indicate a desire to be informed and a determination to improve the condition of things here; all of which argues well for the success of the convention, and for all of which the Board desires to thank you.

In times previous, when I have attended other sanitary conventions, I have not always prepared my remarks beforehand, but this time I have departed somewhat from my usual custom. Soon after I have returned home from other conventions, I have received a note from Doctor Baker, asking me to write out my remarks; and, if I neglect to do so, I soon receive another note asking me if I have forgotten to write out my remarks. When I do write them out, I sometimes write what I said, and sometimes write something entirely different; so, I have profited by experience, and this afternoon I will read what I have to say, which is as follows:

These sanitary conventions are designed for the benefit of public health. This one is held here at the request of your health officer and leading citizens of your town, and is intended to call the attention of all your people to the necessity of a more careful observance of such means as are known to be necessary to prevent the introduction and spread of disease in your midst. It is not a medical convention, and is not intended for the especial benefit of physicians, but for all the people, physicians, lawyers, clergymen, ladies and all citizens willing to aid in an effort to improve the general health of your city, and particularly to prevent the introduction and limit the spread of contagious or communicable disease.

Holland is located on the banks of a beautiful lake, and just off the eastern shore of one of the finest and largest bodies of fresh water in the world. Its facilities for drainage and sewerage and for obtaining an abundant supply of pure water are unequaled. Its prevailing currents of air from the west, southwest and northwest, are purified and tempered by a passage of from sixty to one hundred and fifty miles over the ever undulating and often tumultuous surface of magnificent Lake Michigan. It was designed as a natural health resort. If it is not such in fact, is no fault of its location or its surroundings. But, no doubt, a fault exists somewhere. One object of this convention is to discover the fault and to aid

you in correcting it. It will not do to charge it to nature or to Providence. Nature has done her part and Providence does not afflict without cause or motive. Suffering is a penalty for violation of laws, both human and divine. The thief suffers in prison. A night's debauch is followed by headache and sick stomach. The sour grapes of the fathers set the children's teeth on edge. The sins of parents are visited upon the children even unto the third and fourth generation. These are all penalties for disobedience; and are enforced under the moral law against every offender. The command, "Let no guilty man escape," is more uniformly enforced against moral wrongdoing than against whisky trusts. Divine law always exacts the penalty; there are no miscarriages of justice under it. It is a well known law of nature that like begets like. If we do not wish to raise deformed and diseased animals we must breed from perfect and healthy ones. We do not gather grapes from thorns or figs from thistles. What a man soweth that shall he reap. If he prepares the soil and sows the seed he shall reap diphtheria, scarlet fever, typhoid fever, small-pox and every disease of whatsoever kind he sows. This is just as true as though it were taken literally from the bible.

An enemy sometimes sows tares, but more often it is done by careless or thoughtless persons. Whether from vicious enemies or careless neighbors the seed is sure to come in time, and if we have surrounded ourselves with favoring conditions we are sure to reap the harvest of sickness and suffering. No man lives for himself alone. We are all in many ways our "brother's keeper." When our neighbors are in danger we are not safe. To secure protection for ourselves we must protect our neighbors. The family is the unit of the State; municipalities are an aggregation of families under local governments. These municipalities make up the State. The first and highest duty of the State is to provide for the welfare of these families, its citizens.

The prosperity of the State depends upon the intelligence, courage and muscle of its citizens. Sickness destroys courage, weakens muscle and impairs intellect; and is an ever potent factor in lessening the prosperity of the State.

The State delegates to each municipality large local powers, and among these, authority to provide for its own safety and protection against dangerous and communicable diseases. Each is required to have a Board of Health and a health officer, and the general law very clearly defines their powers and duties. No municipal board has greater authority than the Board of Health. These local boards are the sanitary police commissioners of their respective cities and towns; and the health officer is the executive officer of his board. Everything pertaining to the sanitary police of the city comes under their authority. Such as abating nuisances, disposal of excreta, garbage and waste; cleaning or filling up cess-pools and privy vaults, when such abominable culture beds of disease are still in use. To see that the streets and alleys are kept clean; and to give timely notice according to law of every outbreak of any contagious disease dangerous to public health, and to see that the law relating to such diseases is strictly complied with. It is the duty of the common council to provide drainage, sewerage and a proper water supply.

Of course, a perfect sanitary condition cannot be established and maintained without the expenditure of money. Every good thing in life costs money or its equivalent, labor. Money in a man's pocket is like labor in a man's muscle, neither is of value until expended. Take into account, loss

of time, physicians' fees, cost of medicine and nurses, etc., and it is easy to demonstrate that sickness costs money. Money well spent is money saved. Money wisely spent to improve the sanitary condition of any municipality and to protect it from invasion and spread of contagious disease, is a good investment, and one that will be returned to the community in due time with compound interest. To present facts in demonstration of these views and to elicit discussion of methods relating to the prevention of sickness and untimely deaths, and to interest your Board of Health, health officer and all citizens, in the work of preventing disease, and to imbue all thoroughly with the truth of the well known maxim, that an ounce of prevention is worth more to any community or family, than a pound of cure, is the object and purpose of this convention. And to the papers which will be read and the discussions which will follow we invite your earnest attention and active aid.

The president of the convention, O. E. Yates, M. D., then spoke extemporaneously, substantially as follows:—

PRESIDENT'S ADDRESS.

BY O. E. YATES, M. D., HOLLAND.

(Reporter's Abstract.)

Ladies and Gentlemen:—

I confess great embarrassment in rising after this able address by the President of the State Board of Health. I see, in looking over the program, that this is not a convention for physicians only, but for the people generally. I see that the program has been very carefully prepared, and that there has been great care taken to keep the avaricious doctor from monopolizing all the time. I see that one of our state-wide-known lawyers, and one of the most prominent ministers of this city will talk to you this evening; also, that one of the salaried officers will be present, and speak to you on the restriction and prevention of the dangerous communicable diseases, from the standpoint of the health officer. He receives the magnificent salary of one hundred and fifty dollars, on which to support himself and family. *

By aid of the microscope, impurities have been discovered in our drinking water, and in the air we breathe, and one of the members of the State Board will tell you what he knows about these little organisms; and another member will tell you how to prevent sickness.

In accordance with the program, Hon. Frank Wells, of Lansing, then read an address as follows:

THE GERMS OF DISEASE.

BY HON. FRANK WELLS, MEMBER OF THE STATE BOARD OF HEALTH, LANSING.

The discovery of the microscope has extended the boundaries of human knowledge and brought within its horizon a "third kingdom." Regarded at first as one of the curiosities of nature this kingdom has, during the last two decades, assumed very great importance. Its varied but infinitesimal inhabitants have been shown to be in large measure the means of life and the cause of death.

*** Dr. Yates afterwards explained that the health officer, as such, received only fifty dollars, but he receives one hundred dollars for treating the sick poor.**

Organic life of every form is subject to their potent influence either for weal or woe. While many of them coöperate to prolong life and to preserve health others are constantly seeking some unguarded spot upon which to plant the seeds of disease and death. No sooner have the latter accomplished the destruction of a victim however than they give place to others which at once prepare the lifeless form, by disintegrating the complex elements of which it is composed, to enter upon a new cycle of life.

A tree, a plant, or an animal falls and soon disappears from our sight. Whither has it gone, and by what means? All the material used in its structure came directly or indirectly from inorganic nature, while from a parent similar to itself it inherited the mysterious force we call life. This force blended the material furnished by nature into the complex compounds necessary for all the tissues and organs essential to the plant or animal in process of construction and prescribed at the outset by the potent influence of the primordial cell.

As long as life continued chemical processes to maintain this organism and to which we give many names were sustained by means of the lavish material which earth lends so liberally to her children. That she only lends, is a very old story. The manner by which she exacts a return of the last atom she has lent, is a new story. The *old* belief concerning this manner, accepted by chemists until within a recent period, held that the oxygen of the air communicated a molecular motion to particles of dead matter, which produced fermentation, and thus resolved them into new products or into their original elements. The *new* belief, which is not now merely a belief but a demonstrated fact, is that living organisms cause ferments which produce these changes.

New views regarding the causes of ferments and putrefactions began to be entértained but little over a half century ago, when a noted chemist, Schwann, affirmed that he always detected the presence of living organisms during these processes. To him and to another chemist, Caguiard Latour, about the same time, each independent of the other, is due also the discovery of the yeast plant and its rapid growth, and multiplication.

That the operation which we call putrefaction is performed by successive generations of minute organisms is today too well known and too readily proved to be doubted by any intelligent mind, yet it was but a few years ago that the most distinguished chemist of his day, the learned Liebig, treated the theory with disdain. Liebig's belief, and the belief of the scientific world of his day, was that oxygen slowly consumed all dead animal and vegetable substances. A simple fact shows this belief to have been entirely without foundation and that air freed from all bacterial life, has little or no effect upon organic substances. Fill a bottle with any putrescible article like beef broth, subject the contents to heat sufficient to destroy any life contained in the bottle and cork it immediately with a plug of cotton wool which has likewise been subjected to heat sufficiently great to sterilize or free it from living organisms, it is plain that the external air will have free access to the contents of the bottle; but under conditions which will filter from it every trace of life, no matter how minute. If the experiment has been carefully conducted the substance in the bottle will remain unchanged for years. This clearly shows that it is *not* the air but the low forms of life with which air is laden, under ordinary conditions, which produce those effects so familiar to us all when lifeless, animal or vegetable structures are brought into contact with it at ordinary temperatures and

without the protection just described, or something equivalent to it. The process of canning fruits and vegetables common in nearly every home, is an exemplification of the fact, that once deprived by heat, of the living products of change, these substances, when hermetically sealed, remain in their original condition. The part played by micro-organisms in fermentation is as important as in that of putrefaction.

The wonderful work of the yeast plant, to which we are indebted for bread, wine, beer and alcohol, is a remarkable exhibition of some of the accomplishments of these organisms. If you expose sugar and water, or substances containing them, like wine, cider, or malt, to the air you will find after a time that they contain myriads of oval living bodies. These bodies after reaching adult size, about 1-3000 of an inch, put forth a tiny bud, and this very soon another, to be followed by a third and so on continuously, the process of multiplication being exceedingly rapid. Of course this growth can only go on at the expense of something contained in the solution and it is readily conceivable that a time is reached when the food supply becomes exhausted and the plant dies from starvation. During its life, however, it has wrought a complete and marvelous change in the solution that has nurtured it and has besides shown its ability to exist and flourish without the aid of that element usually deemed necessary to the existence of life, air. Upon investigation we find, instead of the sweet solution, a liquid containing carbonic acid gas and alcohol. These minute alchemists have mysteriously changed the sugar into these products. The gas as it has been generated, being heavier than air, has formed over the top of the liquid, preventing access of air and compelling the organisms to do their work without it. Their ability to wrest from the solution in which they exist oxygen and carbon and give them off as carbonic acid gas shows that they belong to the class of organisms called anaërobic to distinguish them from the class requiring the oxygen of the air for their existence and which are styled aërobic.

Fermentation, like putrefaction, marks the first steps in a succession of changes whereby highly organized products are finally reduced to the original simple elements of their composition. Each step in these changes produces a simpler combination than existed before and is the result of the life work of organisms peculiar to its condition. After the alcoholic ferment may come the acetic and the alcohol created by the action of one organism by the action of another is changed to vinegar. In like manner in putrefaction after bacteria may come monads or mould to continue the disintegration already begun.

Besides the two general divisions of micro-organism we have named the aërobic and the anaërobic their several methods of reproduction naturally divide them into three other classes.

The first is the *budding* or yeast plant variety already described. The second is the variety which reproduces by *fission* or *division*. The single cell of protoplasm which represents all micro-organisms divides in the center and becomes two, these two again divide making four, these in their turn divide and this process continues so long as conditions favorable to growth remain. The last variety produces spores or seeds. These spores float in the air as do those of the thistle or dandelion and are carried by the winds great distances from the places of their production. So rapid is the multiplication of these organisms, doubling as many of them do every hour, that were it possible for conditions favorable to their existence to continue it would require 51 figures to express their number and they

would cover the entire earth to the depth of a mile in the space of one week.

The progeny of each species never varies greatly from that of the parent. A long contest has been waged over the theory advocated by many scientific men that these organisms being the lowest forms of life known were generated under favorable conditions spontaneously. It was claimed that the appearance of life in all putrescible substances proved this to be true, but after it was shown that when such substances were sterilized by heat and were afterwards protected by hermetically sealing the bottles containing them or by filling the mouths of such bottles with filters of sterilized wool no changes took place in their contents, this theory was necessarily abandoned.

The presence of a living organism of any kind is now regarded as a certain evidence that a similar one lived before it and was responsible for its existence. Each produces after its kind, and only after its kind.

Having now glanced at the grand series of phenomena by which all that is dead is transformed into those elements which are the substratum of life, and which are necessary if life is to continue upon the earth, and the role played in these changes by the minutests of organisms, let us now consider their even more potent influence in the destruction of life and health.

The similarity of many of the phenomena which characterize the lowest order of life and those which are peculiar to many diseases are very striking. Such similarity could not long escape the attention of physicians and other investigators into the causes of epidemics.

The conception that virulent diseases like ferments were caused by the action of micro-organisms gradually developed into a theory. Students in great numbers immediately entered this realm and almost before the new belief had reached the dignity of a theory, it was elevated to the pinnacle of a science.

Most prominent among these students was a young chemist and naturalist who had already won a reputation for originality of research, accuracy in experiment and close reasoning. He brought to bear upon his labors a subtlety of penetration and an exactitude of method which placed him far in advance of other investigators in this field.

He had fought the battle of the cause of fermentation with Liebig, and that of the spontaneous generation of life with Bastion and others, and had come off in each of these important contests the victor.

None could be better equipped to demonstrate, therefore, the great fact that all epidemic diseases are caused by a class of minute organisms, similar to those which produce ferments, than this brilliant student whose fame now encircles the globe, Louis Pasteur.

The attention of Pasteur was first directed to an epidemic, which in 1849. fell upon the silk worm nurseries in France. This he undertook to investigate, and to seek a remedy for. Two years were spent by Pasteur, his wife and daughter in this work. He demonstrated that the disease was caused by minute organisms which not only attacked the worms, but, in its germ form, was found within the tiny eggs of the moth. Careful selection and isolation of uncontaminated eggs was the successful remedy finally reached. Though this required vast patience and time it resulted in restoring wealth to an almost ruined country, and joy to a despairing people.

Pasteur next attempted to penetrate the mystery of a disease which for

centuries had decimated the flocks of France and other countries, called anthrax. His method, which had now served him for twenty years, was simple and conclusive. A drop of anthrax blood was placed in a flask of some suitable infusion, previously sterilized by boiling, to free it from germs. In a few hours it was filled with myriads of bacteria. A drop of this first cultivation sown in a second flask, prepared in the same manner as the first, showed itself no less fertile. This was continued through twenty or thirty similar cultures, always with the same result. A minute quantity from any of these cultures introduced at any time under the skin of an animal, would produce death from anthrax in two or three days. A great and valuable scientific fact had been demonstrated. The virulence of this disease was found to be due to living microscopic organisms.

An epidemic among fowls called chicken cholera was also found by Pasteur to be the result of a similar cause; and the disease capable of transmission through cultures prepared by placing a drop of blood taken from under the wing of a diseased fowl in heat-sterilized broth. Fowls inoculated from any of these successive generations immediately showed the characteristic symptoms of the malady followed by death.

Pasteur's mind had long dwelt on the discovery of Jenner, and upon the significant question which it suggests that if one recurrent disease may be prevented by producing a mild form of such disease, why may not many others? In causing the microbe of fowl cholera to pass from culture to culture in an artificial medium, Pasteur permitted an interval of 24 hours to elapse between the time of sowing each successive culture. He then studied the effect upon the virus of increasing this interval. He found that when this was continued for several days, weeks, and even months, the contagium became weakened in power in proportion to the length of the interval. A virus permitted to remain in a flask, the mouth of which has been protected from the introduction of foreign germs by a stopper of cotton wool for three months, if used to inoculate fowls, will render them more or less ill; but fails to produce death. But if this fact is extraordinary, the one which follows is much more so. If, after these fowls have recovered from this inoculation, they are reinoculated with a virulent virus or that which produces death in the uninoculated, they are scarcely even made ill. The conclusion from these facts is irresistible. The disease can protect from itself; and like most, if not all virulent diseases, it cannot attack a second time. The enfeebled microbe is shown to be a real vaccine, its power becoming attenuated in proportion to the time of its exposure to air. At any stage of enfeeblement, the virus may be kept, by being protected from the oxygen of the air in hermetically-sealed-glass tubes, for months, or even years, without change.

Could the microbes of splenic fever be attenuated so as to produce a vaccine for that fatal malady, was now the question Pasteur was called upon to face. The microbe which produces the anthrax disease, like most similar organisms, reproduces itself by fissure or division while that of chicken cholera forms spores similar to the seed pods of plants. These spores may be exposed to the air for years without losing their virulence, but are always ready to reproduce their kind and manifest their power whenever they find lodgment in the bodies of animals. After much research Pasteur learned that below a temperature of 45° anthrax bacilli produce no spores, and may be cultivated and attenuated in the same manner as those of chicken cholera. It is difficult to estimate the value of the practical effect which followed this discovery. Sheep and cows were vaccinated

as rapidly as the virus could be obtained, and almost certain immunity was secured from the ravages of this malady.

The parasitic origin of epidemic diseases in animals having been demonstrated, investigations now turned toward the same class of diseases in man.

Dr. Robert Koch, of Berlin, already in his own country at the head of investigators of the mysteries and character of microscopic life, announced in 1881 that he had discovered tuberculosis to be due to the presence of a peculiar living organism. He had found a characteristic and hitherto unknown bacillus in all tubercularly altered organs. They appeared as slender, rod-shaped organisms, and were present in vast numbers, both separated and crowded into small, dense groups. He discovered them in all animals in which the disease existed, and in monkeys, dead from consumption, they were seen in countless bunches, pervading nearly all the internal organs. They have no motion but that of growth; and in the body form spores which may float in the air and retain their virulence for a long time. They are readily cultivated in artificial media, and these cultivations can be made to produce the disease by inoculation. Though successfully resisted by the life of a healthy lung, any hereditary or acquired predisposition which favors an inflammatory or congestive condition of this organ may permit the lodgment and destructive work of this malignant and deadly parasite.

Among disease producing organisms, the one most ardently sought for by bacteriologists, was the typhoid fever "germ." There could be no doubt of its existence and after a long series of tests and observations by many searchers it was discovered by Koch and Prof. Eberth about the same time in 1880. In form and method of growth this organism resembles the common baccillus of putrefaction. It possesses the means of locomotion by means of pseudopodia or processes which it has the power of throwing out from either side. It is readily transferred from a diseased organ to artificial media where it may be transmitted through successive cultures without impairing its virulence. "It grows luxuriantly in milk and is one of the few organisms which are capable of vegetating in drinking water." In 1881, Pasteur, while pursuing his investigation of that dread disease, the successful treatment of which will always be associated with his name, inoculated a rabbit with the saliva of a child affected with hydrophobia. The animal died rapidly, not of hydrophobia, but of septicæmia. It was subsequently discovered that saliva from one ill with pneumonia produced a similar effect upon rabbits. Continued experiments by numerous observers resulted in the isolation of an organism now known as *Fraenkel's diplococcus* or the pneumonia dumb-bell; the latter words expressing both the character and form of the specific cause of that dread disease, pneumonia. This organism is met with in the saliva of healthy persons and it is claimed that in such cases it is a remainder of pneumonia which the person must have suffered from at some previous period, and that to its presence is due the well known liability of such persons to a second attack. More knowledge is needed concerning the peculiarities of this variable microbe whose nature and characteristics are now being investigated by many observers.

The Lœffler bacillus now generally admitted to be special to diphtheria is peculiar in several particulars. Though very poisonous it fails to produce the characteristic symptoms of this disease upon rodents inoculated

with it. Cultivations from it are not always active and in human beings it is not met with in the blood but is confined to the affected surface.

Unlike rodents, dogs are susceptible, and exhibit those paralytic effects which mark diphtheria, when inoculated with this organism.

In 1884 it was discovered that the discharge from a wound which had given rise to tetanus or lockjaw would by inoculation produce a similar disease in rabbits. A little later it was learned that a bacillus found in garden soil, would produce this disease when injected under the skin of animals.

In 1886 Koch demonstrated, as did many others, the important fact that this disease is always the effect of the actions of this peculiar organism.

Every species of micro-organism has a distinct family form which never varies, except as do plants, through growth and changing conditions. *Bacteria* is a name now quite commonly used for all, though originally applied to those the length of whose bodies was several times their breadth. *Bacillus* is a term for a still more slender body. Both appear frequently in long chains. These vary greatly in size, an average length being about one-twenty-thousandth of an inch. *Micrococci* are small points or specs and form a very extensive class.

How do these minute forms, which only the most powerful microscope is able to reveal to the eye, and then only by the aid of stains which affect differently the organisms and the surrounding medium, produce disease?

Many answers to this question have been presented. Another question allied to this, and of equal interest, is that of the means by which an attack of many diseases like measles, whooping cough, etc., renders the body proof against a second attack.

While it is evident that disease producing germs within the body may affect functional activity and seriously interfere with vital processes, yet it is apparent that such merely mechanical influences cannot produce all those destructive effects which signalize their advent. Among the earlier beliefs most generally favored was one that certain constituents of the body, necessary for the existence of the parasites which found within it their home, became exhausted. The objection to this belief is, that the body is never so generally under the control of these organisms as to yield to them all its available nutriment. Besides, if the body should become depleted in this way, the supply, upon the removal of the cause, would be renewed.

The phagocyte theory has many adherents. This theory is based upon the well-known fact that the white blood corpuscles remove from the serum effete particles that have performed their functions. These leucocytes seem to possess an independent existence and are analogous to those primitive forms of life whose single cell of protoplasm serves for stomach and all the other organs of the more highly organized creations. They have the power of motion and wrap themselves about substances they wish to absorb. It is claimed that disease-producing organisms, entering a blood vessel, are at once assaulted by these corpuscles, and if possible destroyed. When it happens that the invaders are too numerous or too strong for their adversaries, disease and perhaps death to the body follows. There is much to make this theory seem plausible, notwithstanding the claim that leucocytes are scavengers rather than fighters. It is maintained that they are merely buriers of the dead, or, rather, open graves prepared to receive the bodies of the enemy, and not the soldiers who destroy the lives of

invaders. While the microscope has been constantly opening up to our vision facts relating to these obscure questions the aid of chemistry has been invoked to help us to understand the significance of the revelation.

It had been long known that during the changes taking place in a lifeless animal or plant, as its cellular structure was being broken down and resolved into its original elements, peculiar chemical substances were developed. Many of them had been analyzed and their composition proven. These products were known under the general name of Ptomaines.

They were invariably found to be the results of bacterial action, in the processes of fermentation and putrefaction. A large proportion of these products were found to be extremely poisonous. In many cases the most minute quantity introduced into a healthy animal would quickly affect the entire body, producing serious disease and death. These effects were analogous to those of the sting of a bee, the bite of a venomous reptile, or rabid animal, where absorption of the smallest amount of poison is followed by rapid, extensive, and often fatal, consequences. Knowledge of Ptomaines and their influence naturally led to the inquiry: why may not living tissue, equally with dead, exhibit poisonous ferments, when acted upon by bacteria? Cultures of organisms known to be the causes of various diseases were sterilized by heat and filtered. Such filtrates though entirely deprived of life, were found, when introduced into the bodies of animals, to produce in many instances all the characteristic symptoms of inoculation by the organisms themselves. This discovery has marked a long advance in our knowledge of the methods by which disease-producing germs perform their work, and has thrown much light upon the questions we are considering.

With the evidences thus far accumulated concerning the action and effects of disease producing germs, the answer to the question of how these minute forms produce disease, should probably differ as much as do the diseases for which they are responsible. While in all cases the influence spreads from some focus of infection, in some diseases, like splenic fever (anthrax) and consumption, this spread is through the multiplication and dispersion of myriads of bacilli into tissues and organs. In other diseases, like diphtheria and tetanus, the organisms while remaining localized have the power to create poisons; and it is the diffusion of these poisons throughout the body which destroys life. In several diseases it is evident that the organisms which initiate the work of destruction give way at a certain stage to others which conclude it. This is perhaps the case with epidemic pneumonia, diphtheria and scarlatina.*

It should be added that the poisons set free by most disease producing organisms have been subjected to chemical analysis and their properties, like the Ptomaines, have been expressed in chemical symbols. I can only allude to the important work of Dr. Vaughan, member of the State Board of Health, in discovering and isolating the poison produced in milk and cheese, which he named Tyrotoxicon. The same eminent chemist and his assistant, Dr. Novy, have obtained from cultures of the typhoid bacillus, found in drinking water which had produced typhoid fever in persons using it, an extract which caused cats to exhibit all the symptoms of the disease, with characteristic intestinal ulcerations.

Finally, chemistry, while throwing much light upon the problems, has greatly increased their complexity. We see clearly that much is yet to

* Croonian lectures of J. Burdon Sanderson in November numbers of British Medical Journal, 1891.

be learned before we can consider them satisfactorily solved. Some things, however, we are sure of. We know that a large proportion of the diseases to which the human family is subject is the result of the life processes of micro-organisms within the body; we also know that most of them are preventable.

To collect knowledge regarding these dangerous foes to health and life, and to show how their attacks may be guarded against, is an important part of the work of the State Board of Health. Meetings like the present afford admirable opportunities for considering such subjects.

President Yates.—I am exceedingly sorry that I shall have to announce that it will be impossible for Doctor Vaughan to be with us this afternoon, but that there is a chance for his being here this evening. In his absence, Doctor Baker, member of the State Board of Health, will open the discussion on the subject of Germ Diseases.

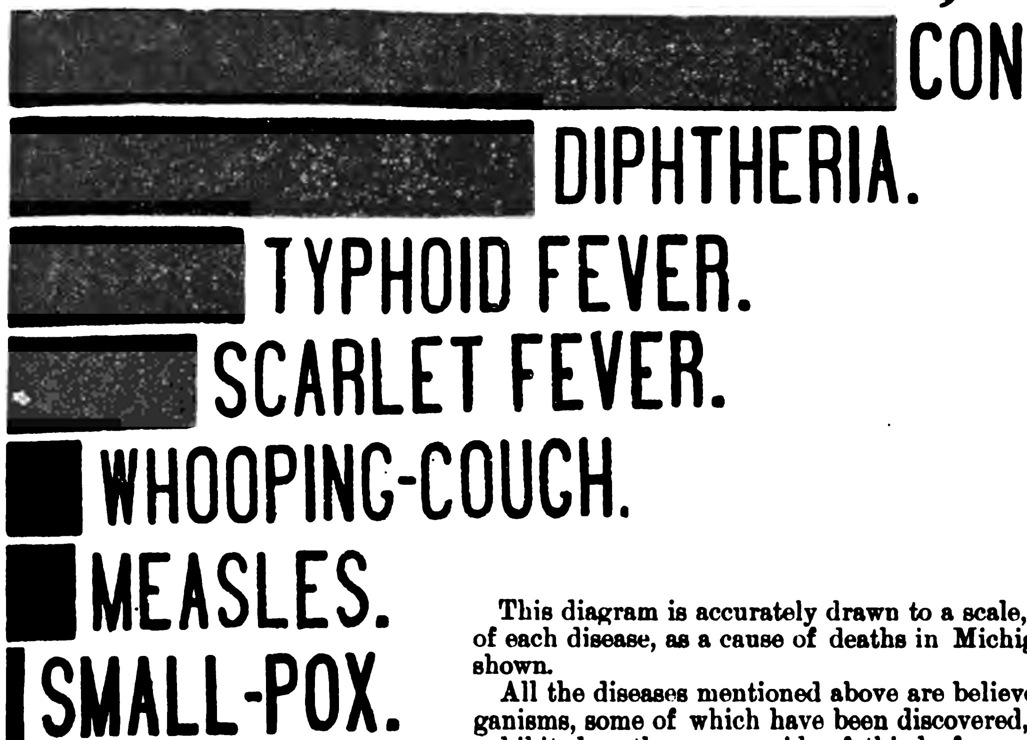
Dr. Baker asked attention to a chart, hanging before the audience, on which he pointed out graphic representations of some of the germs mentioned in Mr. Wells' paper. (A copy of the chart, reduced in size, is printed on page 15). In the upper left-hand circle is shown the yeast plant, magnified (in the printed diagram) about 500 diameters. Just below it, is the bacillus tuberculosis, the specific cause of consumption, magnified about 1,100 diameters. In the central circle, is the bacillus of typhoid fever, magnified about 1,100 diameters. Immediately below it, is the spirillum of Asiatic cholera, magnified about 800 diameters. In the lower left-hand circle, is a group of the micrococci which cause erysipelas, by which minute organisms one of the greatest generals of our army was recently destroyed. *Dr. Baker* asked attention to these representations in order that all present might have a clear mental image of the microscopic causes of some of the most important diseases. He pointed out that another diagram which he exhibited (page 14 of this pamphlet), showed the relative importance of those diseases which cause most deaths in Michigan; and it is plain to be seen that the five diseases which cause most deaths are all "germ" diseases. He believed they were all preventable diseases. This emphasizes the importance of the subject of Mr. Wells' paper.

Dr. Yates—This is a very important subject, and I should like to have some of the other physicians present discuss this subject. I should like to hear from Dr. Avery on the subject of consumption.

Dr. Avery, Greenville.—The restriction of consumption is of vital importance to the citizens of Michigan, as you will see by the diagram there, showing the deaths from consumption in comparison with the deaths from the other diseases in Michigan.* It is only lately that physicians have come to recognize consumption as a contagious disease. I will say to the people here this afternoon that I believe that this disease is contagious, and should be treated and dealt with as such. Not all people who come in contact with a consumptive take the disease, as is perhaps less generally the case in small-pox, diphtheria, scarlet fever, and some of the other contagious diseases; but these diseases are contagious, and if there is a favorable soil for the growth of the germ, in persons exposed to the disease, they contract it. Sometimes the father of a family will take

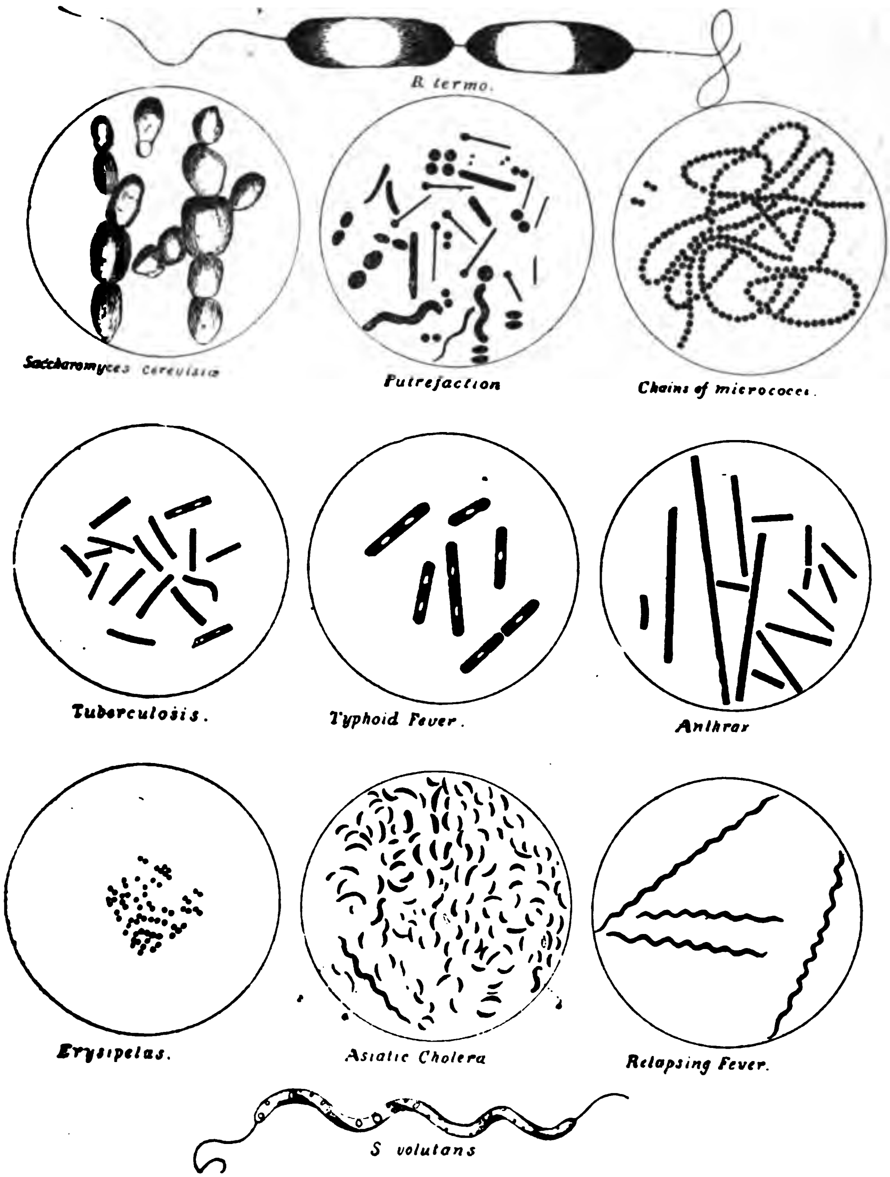
* The diagram, "Deaths in Michigan, 1876-87," is printed on page 14.

DEATHS IN MICHIGAN, 1876-'87.



This diagram is accurately drawn to a scale, and the *relative importance* of each disease, as a cause of deaths in Michigan, is, therefore, correctly shown.

All the diseases mentioned above are believed to be caused by micro-organisms, some of which have been discovered, and drawings of them are exhibited on the reverse side of this leaf.



In the above plate are exhibited eleven specimens of micro-organisms, which are magnified approximately, as follows:

Bacterian Termo, * about	2,000	diameters.
Saccharomyces Cerevisiæ (Yeast), about	500	"
Putrefaction (Bacteria) † about	1,200	"
Chains of Micrococci, ‡ about	1,400	"
Tuberculosis (Bacillus), about	1,100	"
Typhoid Fever (Bacillus), † about	1,100	"
Anthrax (Bacillus), † about	1,400	"
Erysipelas (Micrococci) † about	1,300	"
Asiatic Cholera, † about	800	"
Relapsing Fever (Spirillum), † about	1,300	"
Spirillum Volutans * about	500	"

* "Bacteria," by Dr. Antoine Magnin and George M. Sternberg, M. D., F. R. S., p. 40.
† "Microscopical Technology," Dr. Carl Friedlaender. Frontispiece.
‡ The Practitioner (London), Vol. XXXII, p. 261.
§ See the third figure in the diagram on p. 21.

consumption, then the mother, and soon the whole family have been carried away by this dreadful disease; then some one will say that the disease has been inherited, and thus account for the whole family being wiped off the face of the earth.

We cannot keep this disease isolated, for the patients need the fresh air and the out-door exercise. Consumption is not usually contracted from the exhalations of consumptive patients, but from the dried sputa; the only way to prevent consumption is to destroy the sputa, and enforce regulations relative to the habits and actions of the consumptive. Patients should not spit on the floor or carpets; for, when the sputum becomes dry, it will be floated away to different parts of the room with the dust, and may spread the disease to some one else. Patients should expectorate into some vessel containing a fluid, so that the expectorations will not become dry, and then this fluid should be disinfected; or they may spit in pieces of cloth, or something equivalent, which can be destroyed by fire.

The State Board of Health issues, in pamphlet form, certain recommendations for the restriction and prevention of consumption, and, if everyone would do what is recommended in this pamphlet, the number of deaths from this disease would be lessened, and the black line in that diagram, representing the deaths from consumption in Michigan would be much shorter; and there is no reason why it should not be as short as that representing small-pox. We know that, if these instructions are complied with, the disease can be restricted.

Rev. H. E. Dosker.—I wish to ask if there is any truth in the statement that there is limitation of consumption by the Koch method?

Dr. Hazlewood, Grand Rapids.—I think that the Koch method has not proved to be very successful; but, by methods outlined by Dr. Avery, the destruction and disinfection of the sputa before the sputa becomes dry, is practical, and will be found important in restricting consumption. Every consumptive has a duty to his neighbor—to provide himself with something into which he can spit, and carry until he can get to some place where he can destroy his sputa, without soiling his garments or person. Paraffined paper can be as conveniently carried on the person as can cigarette paper, and may be used to enclose the sputum until there is an opportunity for destroying it.

Dr. Yates.—I heartly approve all that has been said, and should like to add, that, as far as possible, isolation of consumptives should be carried out. I might also suggest that there should be no carpets used, but instead, rugs.

After some discussion, the convention voted that Dr. Kremer's paper on the "Water Supply of Holland" should be postponed until the first thing in the evening session.

Charles Scott, D. D., Ph. D., President of Hope College, Holland.—A word relative to the isolation of consumptives. Some one has said that consumption is spread by the dried sputa. If the state of New York was to be represented on that diagram, that black line would reach several times across the paper. It is a hard thing to think of isolating patients, for the disease is a lingering one and may hang on for twenty years, and it would be cruel to think of separating man from wife and parents from children. Many instances have been known where persons have lived with consumptives for years and have not contracted the disease. I should like to have some one discuss this subject of isolation to a greater extent, for it is very much against my views.

Dr. Hazlewood, Grand Rapids.—As regards isolation. If there is a case of small-pox, the family is isolated, and cases of diphtheria are coming to be isolated. As regards cases of consumption, it would be the height of cruelty to isolate patients, for consumptives require, and should have, all the fresh air they can get, and should have plenty of out-door exercise, and their freedom in this respect should not be restricted. There are, however, certain precautions which can be taken by the patient, and which should be enforced by law. Each consumptive should sleep alone, and should have a separate room, which would much lessen the danger of spreading the disease. Beds which have been used by consumptives should be thoroughly cleansed and disinfected before being used by others.

Dr. Yates.—I thank Dr. Hazlewood for stating what he has, for I have had the same ideas, for some time, but could not have expressed them so concisely. When I spoke about isolation, I knew that I was speaking to human beings, and to those having human affections. The dearest affections of all are those of man and wife, but I should sincerely hope that the husband and wife would have separate beds, if either of them was affected with consumption, and that there should not be any more risk than necessary.

Mr. Wells, Lansing.—All the medical fraternity must, in time, come to believe that consumption is contagious. Although there are cases where the disease is not contracted when coming in contact with a consumptive, there are many more where it is contracted. Consumption generally follows a cold or some pneumonic trouble, as these ailments prepare the soil for the growth of the germ. The great trouble in restricting this disease is that persons afflicted will not admit, even if they know, that they have consumption; but generally they do not know, and the disease gets a good start before the patient is aware that he is afflicted.

Rev. H. E. Dosker.—Are there no tables or statistics showing that there is direct contagion? I have known in my profession of whole families, one member after another, being taken away by this awful disease.

Dr. W. C. Ransom, South Haven.—I hold that there is no such thing as direct contagion in consumption. I have practiced in nearly every part of this continent, among the Chinese, the Mexicans, the Negroes, and South Americans, where they have consumption, and where they sleep a great many in a tent or hut, and all breathe the same air, and I know that there is no direct contagion. I married a young wife who had consumption, and lived with her for ten years before she died, and have associated with consumptives all my life, and here I am sixty-three years old and have not got the consumption yet. I hold that no germ ever gave one the consumption, but that the disease is the result of a morbid growth. I wish again to repeat that I do not believe that consumption is due to a germ. I think that it is ridiculous to say that an insect so small that it can hardly be found with a powerful microscope is the cause of this dreadful disease. I do not believe in the theory that has to have a microscope with a wonderful magnifying power, and an imagination twice as strong, to find the little organisms called tubercle bacilli. Consumption is a morbid growth, and it is not due to a germ, and I know what I am talking about when I make this statement.

You never saw a mosquito propagated in pure water. The eggs are always deposited in stagnant water, and the larvæ grow and thrive in such

impure water; and it is not the insect that makes the water impure; but all insects breed and multiply in decomposing material.

Dr. Baker, Lansing.—I wish to reply briefly to the question asked by the Rev. Mr. Dosker, but first to say in reply to Dr. Ransom that consumption is probably not caused by an "insect," although by something somewhat analogous to it—a microscopic plant, the *Bacillus tuberculosis*. It is a fact that on shooting a ball into the vital part of an animal or a man he dies from the effect of the wound; so it is when you inoculate the germs of consumption into an animal; the animal, which before was perfectly healthy, now goes through the sickness of the disease, and dies from the effect of the germs; there is here easily seen a relation between the cause and the effect.

Replying to the question of the Rev. Mr. Dosker:—"Are there no tables or statistics showing that there is direct contagion?" I think there are facts enough on record now to prove the direct and indirect communication of consumption. It is plain, however, that there are not facts enough to convince all physicians, or at least not all physicians have seen facts enough of that kind to convince them. But the proof of the cause, and of the modes of communicating consumption does not necessarily rest upon statistics, nor upon the beliefs of physicians. There has come to be a great class of scientific men who for years have occupied themselves with experiments and researches for which medical practitioners have no time or opportunity. It is from such contributors to sanitary science, the bacteriologists, the chemists, the pathologists, that we obtain our knowledge of the microscopic causes of diseases. And, whatever may be the beliefs of those physicians and others who have not specially studied the subject, the specific cause of consumption is now known, by the sanitarians, to be the *Bacillus tuberculosis;* and the ways in which the disease spreads are now well known.

Dr. Avery, Greenville.—I am glad that our friend (Dr. Ransom) has had such a wide practice, and that he has had such a good chance for study among the different people of this continent. He says he has practiced among the Chinese, Indians, etc., and perhaps among the Esquimaux, and has found that the disease is prevalent, and yet he says that the disease is a morbid growth. He says that the people sleep in great numbers in tents, huts, etc., spit on the floor and whatever they may have to sleep on, and yet says that consumption is not spread by a micro-organism; and, if the doctor's statement is worth anything, it is absolute proof that the disease is caused by a germ, and that the disease is communicable, and is communicated by the germ. He says that consumption is a morbid growth, but he does not tell what causes this morbid condition. He has not looked in the microscope to find the cause of the morbid growth, because he is an unbeliever, but other doctors have, and have spent years in looking for this cause, and have found it to be the tubercle bacillus. I believe that man and wife should not sleep together, if either one is affected with consumption, and that they should have separate beds as far as practicable.

The president of the convention again called the attention of those present to the fact that the convention was not a medical convention, and that the discussions should not be purely medical, and asked to hear from some of the non-professionals; but no one responded; and on motion of Dr. Kremers the convention adjourned until the evening session.

SECOND SESSION, THURSDAY, MARCH 3, AT 7:30 P. M.

The convention was called to order by the president, O. E. Yates. After a duet by Miss Trude Alcott and Prof. J. B. Nykerk, with Miss Boone accompanist, Henry Kremers, M. D., health officer of the city of Holland, gave the following address:—

THE WATER SUPPLY OF HOLLAND.

BY HENRY KREMERS, M. D., HEALTH OFFICER OF THE CITY OF HOLLAND.

The subject assigned to me is one of vast importance to every inhabitant of our city. The subject is an important one, and one to which I can not hope to do justice; but the gentleman who will follow and discuss this subject will undoubtedly interest us all by discussing it in his usual lucid manner.

Water constitutes the greater portion of this earth's surface. Our bodies are largely composed of it. It is estimated that from two-thirds to three-fourths of our bodies, by weight, is water. Water is second only to air in its importance to the animal economy. The nccessity for continual breathing is felt in a few moments. The system does not show so imperatively its need of a fresh supply of water, for it contains in its own liquids a store or reservoir from which it draws; and it is only when this supply is reduced, so as to interfere with the proper functions of nourishment, that the system gives out, and shows the absolute necessity of a fresh supply from without.

All living things contain water; we cannot have development without it. It is through the agency of water that the nourishment we take is carried to every tissue of the body, and repairs the waste that is continually going on in our bodies, and removes worn out material, and discharges them by way of the lungs, skin, kidneys, etc.

From these introductory remarks, I trust we will all agree that it is of the greatest importance that the water supply of any place should be pure and wholesome.

The water supply of Holland is chiefly derived from shallow drive wells. I think that but few open wells are left; in fact, I know of none. The average depth of these wells is from fifteen to twenty feet, where a large supply of water is obtained. The water from our Water Works is derived from three open wells. The largest supply from these wells is surface water, which flows into the wells at a depth of about twelve feet from the urface. One of the wells has a depth of sixty feet, but the supply of water from this well is very insignificant, I am informed, from our Board of Water Commissioners. So we can safely say that the supply of water of this city is surface water, which percolates through our porous, sandy soil, and is continually renewed by rains; or, in the spring, from melting ice and snow.

Now, rain water is generally regarded as pure water; but it greatly depends on the purity of the substances with which it comes in contact. Rainwater, shed from a well-washed slate roof, collected into a clean cistern, is a pure supply of water, taking for granted that the atmosphere is free from dust and other impurities; but, collected into a tank, ditch, pond or lake, it will be pure or impure according to the condition of the water-shed and the receiving basin.

Subsoil water may be rain water purified by filtration, as in springs or wells in clean sand; or it may be so altered by the addition of organic matter from a foul, saturated soil as to be unfit for use, as we often find it in shallow wells, which have been in long use. The water found in these shallow wells is rain water, which, percolating through a soil containing the germs of disease and other filth, carries them with it, and so becomes dangerous for use. That water in wells is affected in this way, even when we have drive wells, has been proved beyond a doubt. A few years past, certain persons in a locality in Michigan objected to having a cemetery in the vicinity of dwellings. One of the Professors of the University of Michigan convinced those who claimed that it was impossible to affect wells at that distance. He sowed a certain amount of salt on the land selected for burying purposes. Shortly after the first rains, the water from the surrounding wells was affected with the taste of this salt. The rain water had dissolved and carried this salt into the wells.

But we need not go so far from home. Most of us remember that Mr. T. Keppel, of this city, lost his barn by fire, last fall. Mr. Keppel had a drive well in this barn, which gave to all appearances good water. As the barn was filled with hay and straw, the fire kept smouldering for days, and the firemen kept a stream of water on the debris during that time. After Mr. Keppel had cleared away the debris, he found that the water from his drive well was unfit for use. Even the horses would not drink it. It had a smell of burned hay, and had changed to a dark color. You will all agree with me that Mr. Keppel's well was spoiled by the water filtering through the burning rubbish, and percolating through the sandy soil.

A few years ago, I was called to attend a poor family who were all taken sick with typhoid fever. Upon investigating the premises, I found an old vault that had formerly been connected with a hotel; had perhaps never been cleaned, and been in constant use. The well that supplied the family with water was not over twenty feet from this vault. I forbade the use of the water from that well, and had the vault cleaned at the expense of the city. This vault was found to contain twenty barrels of night soil. There is no doubt, in my mind, that the water from that well was contaminated from the vault, and was the blame for the sickness and loss of life in that family. And how much sickness and how many deaths from the same sources have occurred in this city, cannot be estimated.

The south-eastern part of the city contains what was originally a swamp. In this section, the water is contaminated from this former swamp. The decaying vegetable matter finds its way into the water. Some have driven their wells deeper in this section, but with the same results. The wells west of Tannery Creek are considered to give the best supply of water.

As already stated, the city water supply is from the same source, mostly surface water. The water analyzed at the University from the first well was considered exceptionally good. As the city is but thinly settled around our water-works, the danger of contamination from vaults is not so great. Still with this sandy soil of ours we can never rest assured until we know that drainage into the soil is stopped.

From what has been said, we will all agree that there is great danger of our drinking water becoming unfit for use, from the constant draining into our soil of human and animal excreta, besides all the slops and refuse.

We have now a population of over 4,000, and a territory of not over one square mile. When we take into consideration that there are comparatively few cemented vaults, and that this draining into the soil has been

going on for over forty years, and comparatively very little vault cleaning has been done. When a vault becomes full, if there is any possible chance, they will move the out house to a new place. Will anyone here dare to deny that the soil of our city must be saturated in a good many places with organic matter, and that some of it finds its way into the water supply of some citizens; and, very likely, the innocent must suffer for the sins of others.

It is estimated that 1,000 of our population take water from the city water-works, leaving 3,000 or more to be supplied from drive wells. There is absolutely no sewerage in the city, to speak of. Everything of every name and nature is returned to the earth's surface. Estimating five persons to a family, we must have at least 800 privy vaults in use, and of necessity almost as many cesspools to receive slops.

A distinguished sanitary writer and medical director, of London, Dr. Letheby, constituted a table based upon investigations of various sanitary writers, and estimates the amount of excremental matter contributed daily by a mixed population of 10,000 at liquid 22,659 lbs., solid 1,775, or a total of 24,434 lbs. On the same basis, a population of 4,000 would contribute 9,600 lbs., or nearly five tons per day. Multiply this by 365, and you will have the sum total for the year. To this will have to be added the excrements of animals, decaying vegetables, slops, etc.

There exists a condition of things in connection with our City Water Works to which I must call attention. The supply for domestic, lawn and other purposes is sufficient from our wells; but, in case of fire, we are obliged to take the stagnant water from our river, which is anything but pure and wholesome. This water in our mains is carried to our homes, and for a day or more we must use more or less of it, even if we flush our mains after the fire. There is no possibility of escape, and we hear many complaints. Only last month a child was taken sick with diarrhoea, which the mother laid to the use of our city water. This water was mixed with river water, of which she was not aware at the time. I think the lady was correct. There is no alternative at present. We all had hopes that the deep well would give such an abundance of water that we would not require the use of river water in case of fire, but it has proved a disappointment.

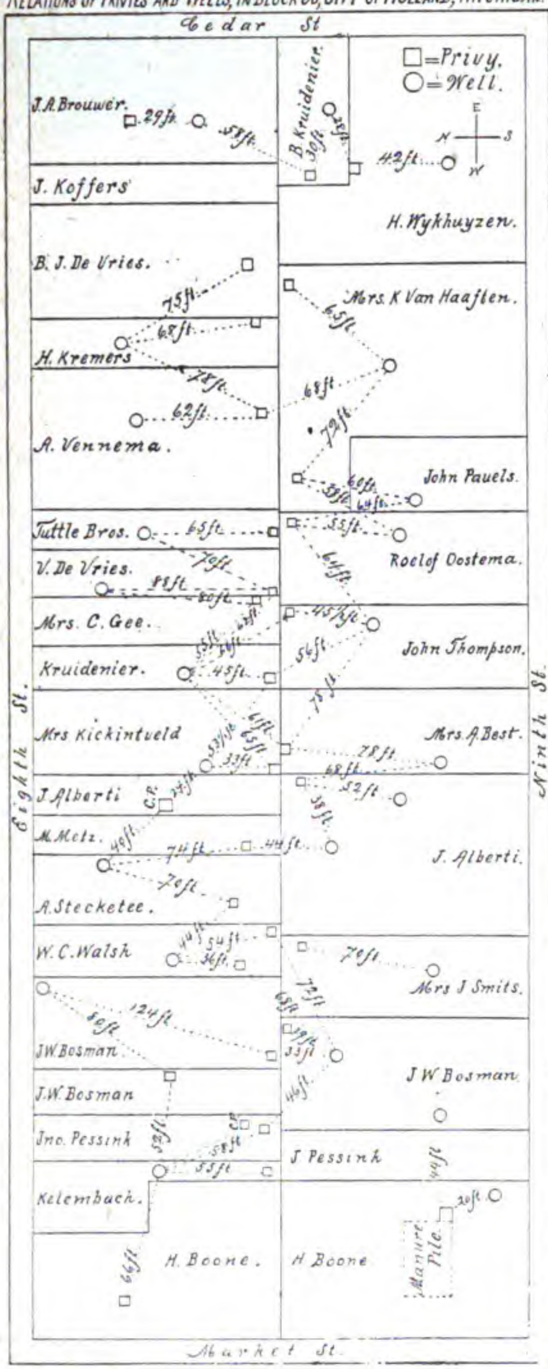
A member of the Board of Water Commissioners informed me that, by putting in a suitable pump, the water could be lifted from the deep well, and in that way plenty of water could be had for all purposes.

The Common Council should place funds enough at the disposal of the Board to investigate this matter, and devise some means to remedy this danger.

What can be done to keep our water supply from being constantly in danger of receiving the germs of disease, etc.? The answer must be—cleanliness. *Let us have clean air, clean earth and clean water.* To do this effectually we should not continue to bury our filth beneath the soil, as is now largely the custom. A complete system of sewerage would give us one of the best methods of disposal of all wastes.

With our system of water-works it becomes an absolute necessity that all who have city water should have sewerage at the same time.

RELATIONS OF PRIVIES AND WELLS, IN BLOCK 36, CITY OF HOLLAND, MICHIGAN.



I am well aware that the great majority of our population are working people, and own their own homes, that it will be difficult for them to take the city water even at a very low rate, and that they prefer to use their own wells. In this case, the city should pass an ordinance forbidding the use of any vaults unless they are cemented, and some rigid system of cleaning introduced and adopted, and most rigidly enforced, requiring the removal of all past and present sources of pollution, and the earth made as clean as possible.

By referring to the map * on the wall, you will find that in block 36 alone there are 31 vaults and cess-pools, —enough to poison the water supply of the whole city.

In connection with the Board of Water Commissioners we have sent three samples of our drinking water to the Hygienic Laboratory at the Michigan University. The result of the analysis has failed to reach me this morning. I have made a few simple tests with permanganate of potassium. With this test some of the wells in block 36 show sewage contamination, but nothing but a chemical analysis, and in some a microscopical examination, will be reliable.

When Prof. V. C. Vaughan arrived he brought with him the reports of the results of the analyses of the

* The diagram, "Relation of Privies to Wells, Block 36, Holland, Michigan," is printed on page 22.

samples of water supplied by Dr. Henry Kremers, and, of which, the following is a copy:

CHEMICAL ANALYSES AND BACTERIOLOGICAL EXAMINATION OF SAMPLES OF WATER FROM HOLLAND.

UNIVERSITY OF MICHIGAN,
Laboratory of Hygiene.

REPORT OF THE SANITARY CONDITION OF WATER SENT BY DR. KREMERS, HOLLAND, MICH.

Source of the water, with remarks on the sanitary surroundings unknown.

Physical Properties.

	No. 1.	No. 2.	No. 3.
Color	Clear.	Cloudy.	Clear.
Odor	None.	None.	None.
Reaction	Neutral.	Neutral.	Neutral.
Hardness	10.5°.	9°.	10°.

Chemical Analysis.—Parts per million.

(1)	Total residue obtained by evaporation at 110° C	390	210	250
(2)	Residue after ignition, or inorganic matter in residue	173	120	180
(3)	Organic residue, or loss on ignition	217	90	70
(4)	Amount of earthy bases, calculated as oxides	------	------	------
(5)	Amount of chlorine, calculated as sodium chloride	13.85	15.675	6.93
(5)	Amount of sulphates calculated as SO_3	Trace.	Trace.	Trace.
(7)	Parts of potassium, permanganate reduced by the organic matter in the water	5.672	22.12	9.48
(8)	Amount of free ammonia	0.068	0.514	0.088
(9)	Amount of albuminoid ammonia	0.090	0.166	0.134
(10)	Amount of nitrates, calculated as N_2O_5	Trace.	Trace.	Trace.
(11)	Amount of nitrates, calculated as N_2O_3	Trace.	Trace.	Trace.

Explanation.

While no absolute standard for the chemical purity of drinking water can be given the following conclusions may be regarded as approximately correct:

(1) The total residue should not exceed 500 parts per million.
(2) The inorganic residue may constitute the total residue.
(3) The smaller the amount of organic residue the better the water.
(4) The amount of earthy bases should not exceed 200 parts per million.
(5) The amount of sodium chloride should not exceed 10 parts per million. A larger amount may be expected, however, in certain salt-producing districts.
(6) The amount of sulphates should not exceed 100 parts per million.
(7) The organic matter in one million parts of the water should not reduce more than 8 parts of potassium permanganate.
(8) The amount of free ammonia should not exceed 0.05 part per million.
(9) The amount of albuminoid ammonia should not exceed 0.15 part per million.
(10) The amount of nitric acid should not exceed 0.5 part per million.
(11) The best waters contain no nitrous acid, and any water, which contains this substance in quantity sufficient to be estimated should not be regarded as a safe drinking water.

Note.—The word "trace" whenever used indicates the existence of the substance in quantity sufficient to be recognized by the test, but too small to be determined quantitatively.

Microscopical Examination.

Description of deposit, if any, magnified 100 diameters: 1, 2, 3, Indeterminate granules.

Same magnified 500 diameters. 1. Vegetable fibres, mould. 2. Vegetable detritus. 3. Vegetable cells and green algae.

Explanation.

Six ounces of the water are placed in a conical glass and the deposit, if any, is examined after from 12 to 24 hours. The presence of any appreciable deposit, especially if it be of animal or vegetable nature, would detract from the suitability of the water.

Bacteriological Examination.

Number of germs developed on a gelatine plate inoculated with one drop of water

	No. 1	No. 2.	No. 3.
(1) After 24 hours	20	0	0
(2) After 48 hours	20	180	120
(3) After 72 hours	20	180	120

Remarks on the kinds of germs observed:

No. 1, Bacillus liquifuciem albus and B. albus.
No. 2, " " " " " "
No. 3, " " " " " " and B. albus putridus.

Inoculation Experiments.

Kind of animal inoculated with the germs: Rats.
Method of inoculation: Injection into abdominal cavity.
Kind, amount and age of culture used: Twenty drops of beef-tea twenty-four hours old.
Results of the inoculation ....
Post mortem appearances ....
Description of the germs, if any, found in the organs ....
In what organs were the germs, if any, found growing ....

Explanation.

One drop of the water is added to one drachm of some culture medium, such as beef tea, and this after it has been kept at the temperature of the body for 24 hours or longer is used for inoculating animals.

Conclusions.

....
....

VICTOR C. VAUGHAN, M. D.,
Director of the Michigan State Laboratory of Hygiene.

ANN ARBOR, March 2, 1892.

After the address by Henry Kremers, M. D., Victor C. Vaughan, M. D., member of the State Board of Health, Ann Arbor, gave an unwritten address, of which the following is the reporter's abstract:—

GERM DISEASES.

BY PROF. VICTOR C. VAUGHAN, M. D., PH. D., MEMBER OF THE STATE BOARD OF HEALTH, ANN ARBOR.

(Reporter's abstract.)

Mr. President, Ladies and Gentlemen:—

In 1849 a German by the name of Pollender, while studying the blood of animals suffering from anthrax, found a mass of innumerable fine, rod-like bodies which he thought might have some relation to the causation of

the disease. In 1855 Pollender published his discovery, which opened a new era in the study of anthrax. His discovery was not recognized by the people as correct, and he was made fun of, and it was said that it was a mistake probably due to imperfections in his glass, others said that it must be some inorganic matter in the blood, and others said that it was due to an imperfection in the brain.

In 1861 Davaine took up this study of anthrax which Pollender had left off, and said that these little rod-shaped bodies were *bacteria*, and he believed them to be the cause of anthrax. By inoculating other animals with the blood supposed to contain these bacteria he was able to cause the disease and death. He also inoculated with blood which did not contain these bacteria and could not produce the disease; so he concluded that these micro-organisms were the cause of the disease; but his work was not accepted.

Pasteur soon after took up this line of work, and isolated these micro-organisms, and cultivated them, by growing them in a beef-tea solution; he carried them through many different generations, and then injected them into an animal, and produced the disease.

Koch followed these investigations, and found that the micro-organisms could be cultivated on gelatine, the same substance that the ladies prepare for their tables. Koch found a mould on the gelatine, which was composed of little rod-shaped organisms; and, if placed on other gelatine, it would grow indefinitely; and now these germs have been cultivated and grown in almost every bacteriological laboratory in the world, and I have some here which I will show you.

What about the germs which cause consumption?

1. In order to prove that a given germ is the cause of consumption, the germ must be found in every case of consumption, if there is one exception that throws all out. In 1882 Koch said that he had found the cause of consumption; since that time doctors from north to south and from east to west have found this germ in every case of the disease where they have taken the pains to examine. But this does not prove the question; for, as there are rats in every town, that does not prove that the town is made up of rats. The proof must go further.

2. After we have found the germ in every case, we must isolate that germ, and separate it from everything else. Supposing the organism is in the blood, we isolate it and cultivate it in the following manner. (Doctor Vaughan here explained the method of isolating and cultivating micro-organisms.) The cultivation of a micro-organism must be examined under the microscope. If the germ cannot be isolated and cultivated we cannot say that the germ causes the disease.

3. This is not all. We must inoculate an animal with the germ, and the disease must be produced in the animal. Take, say, three animals which we inoculate, and three which we do not inoculate, and treat these animals under the same conditions; the three inoculated must have the disease, and the three not inoculated must not have the disease. This work of inoculation must go on in other animals, and in every case where there is an inoculation, the disease must be produced in that animal.

4. The same changes must take place in the animal as in the human subject. The animal must have the same symptoms as the man, it must waste away, and after death its lungs should be found in the same condition as those of the consumptive man.

Long before the observations of Pollender, physicians thought that there must be some specific cause of consumption.

(Here Doctor Vaughan passed around a number of tubes containing germs of many diseases, and some non-pathogenic micro-organisms, in culture material, explained how they were prepared, and asked that care be taken in handling them, as the tubes were only stoppered with cotton; and, if they should be broken, the whole house might be infected with some dangerous disease.)

I have here some tubes containing cultures of some of the different micro-organisms:—1. Here is the theological germ. It is called so because when the priests put away bread and taking it out, after some time, found this mould on it which resembled blood, it was thought to be sacred. 2. Germs of abscesses. 3. Germs of yellow yeast. 4. A germ found in the water, and probably not poisonous. 5. Hog cholera. 6. Red yeast. 7. Black yeast. 8. Germ of grëen pus. 9. The germ which kills 40,000 people in the United States and 1,000 in Michigan every year, and causes about 10,000 cases of sickness in Michigan every year. It is called the typhoid fever bacillus. This particular specimen of the germ was grown from those taken from the spleen of a person dead of typhoid fever.

Let us take into consideration some of the money losses on account of typhoid fever. There occur annually in the United Stateu 40,000 deaths and about ten cases of sickness to each death, which would amount to 400,000 cases of sickness from typhoid fever; twenty-seven days sickness in each case, the nurses and attendants, and suppose that the loss of time is worth fifty cents per day; the loss of time and money is sufficient to put water-works in every town with five thousand inhabitants. Then the 40,000 deaths, at an average of $1,000 for each person lost by death, which I think a very fair price to put on human life if we have to put human lives in the balance against money; leaving out all sentiment and placing human lives against dollars and cents, this will amount to forty millions of dollars per year lost to the people by deaths from this preventable disease. Typhoid fever need not exist. The death-rate from it in the United States is 8.8 per 10,000 persons living. Let us see where it is most prevalent. In Michigan the death-rate from typhoid fever is 6.6. In New York City, where every one is crowded, the death-rate from typhoid fever is only 2, per ten thousand inhabitants, and in Brooklyn 1.5. This is because New York and Brooklyn have made laws relative to the pollution of their water supplies, and have looked to the enforcement of them. In some places typhoid fever has been almost entirely stricken out. (Here Dr. Vaughan referred to and explained the diagram "Typhoid Fever and Sewers in Munich.") With such an explanation as this, can it be said that this disease is not caused by the pollution of the water supply? In Vienna, since the improvements in the water supply, there can be found practically no cases of typhoid fever; in that great college town, they cannot find one case, and have to import them if they have them for use in their medical classes and clinics.

Historians of the future will write and wonder, as did Macaulay about the small-pox in England, why the death-rate from typhoid fever was permitted to remain so high, and why the disease was not stamped out before.

(Here Dr. Vaughan presented the results of the analyses of the water in Holland.)

10. Here is the germ of Asiatic cholera. A student once mixed some of these germs with water, and drank the mixture; he had cholera. How-

ever, typhoid fever kills more of the citizens of the United States in one year than cholera has killed in fifty years.

11. Here is a tube containing the diphtheria germ.

12. This is the consumption germ. It has gone through 130 generations, and every generation has been inoculated into an animal, and it has not in any case failed to produce the disease, which shows conclusively, to my mind, that consumption is caused by this germ.

Hon. Gerrit J. Diekema here gave an unwritten address, "Restriction and Prevention of the Dangerous Communicable Diseases—from the Standpoint of a Lawyer;" and, as Mr. Diekema was afterwards unable to reproduce the address, it is omitted from the Proceedings.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE MINISTER.

BY REV. H. E. DOSKER, PASTOR OF THE FIRST REFORMED CHURCH, HOLLAND.

I am glad that the topic has been somewhat restricted by the committee. It does not touch the ultimate source of disease, but simply the treatment of existing disease, by human means.

The minister of the gospel and the physican are both closely related to human suffering; they look however on it from distinct and different standpoints; the one from a moral, the other from a physical standpoint. To the physician there is merely a *living organism*, which has its functions and disturbances and the question with him is:—how to normally restore the former and rectify the latter. To the minister there is a more *complex organism*. A material being, a spiritual body; the latter influencing the former, and of the two the most valuable. Yet the two professions should labor hand in hand and, under normal conditions, they are not enemies, but allies.

Now the minister has a responsibility, as regards communicable diseases, which may easily be underestimated. As to the question of their restrictability there is but one answer; and the minister of the gospel, who affirms this belief does not by any means surrender his faith in the providence of God. Narrowmindedness is no sign of piety.

History has taught us the two great lessons of the (almost) extermination of leprosy and small-pox, in the civilized world, by segregation and scientific methods of preventing the spread of the disease, chiefly by inoculation in the latter case.

Diseases generally are *preventable* by right living and proper care of one's environment; the contagious diseases, science has plainly demonstrated, become epidemic mostly through criminal carelessness.

And here the minister has a duty to perform. He is to enlighten his fellow men and must, hence, first be enlightened himself. As a moulder of public opinion the Press has not yet entirely supplanted him and hence the obvious duty of the pulpit to correctly inform men of their duty, in regard to communicable diseases.

But what is he to do in case of an epidemic? This question, it seems to me, I am chiefly to answer. I had a lesson, in this regard, and I have tried to master its contents.

When I was a young man in the ministry, I thought it *heroism* to enter

the house of all my sick parishoners, whether the disease were contagious or not. But I was careless once too often. My system was in low condition at one time, as I attended the funeral of a child, dead with malignant scarlatina. In the next house, to where the family lived, two other children were ill, with the dread disease. Suddenly we were told they were both dying. I left the mourners to mourn and went to the dying. An agonized boy, 17 years old, in the most contagious stage of the disease, grasped my perspiring hand. I was inoculated with the poison and felt it. All means of rectifying my mistake failed, and three days later, I was taken with the disease and came near dying with it. For 17 weeks my people suffered *for my folly* and my pulpit had to be supplied by others, at great expense. Since that time I have called on people, ill with contagious diseases, only when *they absolutely* demanded it and then only with the most approved prescribed preparations. In winter I wear a rubber coat and in summer something that may be destroyed or washed, as the character of the disease may demand. In all cases I use disinfectants freely.

My family, I have learned, is as dear to me, as that of the sick. My children as dear, as those that are dying, are to their parents; and hence it seems to me that my experience and dearly bought information demand of me that personally I shall aid in the restriction of communicable diseases.

Careless physicians and careless ministers spread contagion as frequently as any careless layman. These utterances may seem somewhat radical. I believe them to be in order.

The minister should teach his people that restriction is possible; he should show his faith by his works and without loss of sympathy should see to it that he does not become personally responsible for the further spread of the disease.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE HEALTH OFFICER.

BY HENRY KREMERS, M. D., HEALTH OFFICER OF THE CITY, HOLLAND.

It is the desire of all to have health and long life, to have health is one of our greatest blessings. In the book of Job, it says, "All that a man hath will he give for his life." To keep health is, or ought to be, one of the first considerations of every individual. Many good people will say, "Disease, through the dispensation of a wise providence, is sent out, and it is not within the power of man to prevent or restrict it." But, experience teaches us that God rules this earth by a set of fixed laws; and whoever transgresses these laws will surely be punished.

We might ask, "What are the dangerous communicable diseases, and is there really danger from these diseases being communicated?"

The dangerous communicable diseases, as enumerated by the State Board of Health, are small-pox, diphtheria, scarlet fever, typhoid fever, consumption, measles, whooping-cough and probably pneumonia.

We all have a horror of small-pox, and a local health officer finds little opposition to keeping the sufferer isolated. Small-pox has been, in a great measure controlled by vaccination and re-vaccination; and, if proper attention were given to it, might perhaps be wholly eradicated. From

statistics collected by the State Board of Health, the deaths from small-pox are less than from any other communicable disease in Michigan.

Diphtheria is more prevalent than most people are aware of. Of all the communicable diseases, save consumption, none has a greater mortality. Dr. Louis Smith, of New York city, says that diphtheria is to be the scourge of America. I think you all remember the terrible time this city passed through two years ago, how it struck here severely, and how many children were taken from us.

Scarlet fever is a very contagious disease. It is a sister disease of diphtheria. It is to be dreaded on account of its mortality, and on account of the permanent injuries which result from it. Many children become deaf or blind after an attack of scarlet fever.

Typhoid fever, another dangerous communicable disease, causes much suffering and many deaths in Michigan. It is a disease, the nature of which the citizens of Holland should understand. Our soil is such that, sooner or later, our wells cannot be safely relied upon, but when the water from these wells will be contaminated with the germs that produce typhoid fever. The germs of this disease are discharged from the bowels of those sick with the disease, and, if proper care is not taken by disinfection of those bowel discharges, there is danger that these germs will enter our water supply, and thus spread the disease. Instances are on record where the germs from one patient have made hundreds sick.

Consumption is now regarded as a dangerous communicable disease. In Michigan, more deaths have been the result of Consumption than of any of these diseases. I can give several instances where this disease was communicated from husband to wife, or *vice versa*, and where there was no hereditary influence in the one to whom the disease was communicated.

Measles and whooping-cough are dangerous from the fact that many complications arise that prove fatal to young and weak children.

These are the dangerous communicable diseases, shortly enumerated and described.

Now, the second question is,—Are they communicable from one to the other?

We will pass by small-pox, as most people have decided opinions that it is a "catching" disease.

Diphtheria was epidemic with us two years past, and it was a rich harvest for the doctor and the undertaker. I think most of us have come to the conclusion that diphtheria is a communicable disease. The disease spreads by close contact. Kissing a person affected with the disease is very dangerous. The germs also float in the air, and looking at the corpse of one who died from the disease often spreads it.

Scarlet fever is a commuicable disease. The germs are known to have been carried for miles, and appear to have great vitality. Playthings of children who died from the disease, being laid aside for years, have caused the disease to appear in children who have handled these playthings. Let me here impress on the public that scarlet fever, scarlatina and scarlet rash is the same disease. People will say, "My child has only scarlet rash. I need not have a card on my house." The mildest case of scarlet rash, so called, is nothing less than scarlet fever; and, from this mild case, the most malignant cases may develop. We should never use the term "Scarlet rash."

Typhoid fever has been touched upon. The best authorities agree that consumption is communicable. The sputa from consumptives contain the

germs. Most of us know of whole families dying from the disease. This was formerly ascribed to hereditary tendencies. But, perhaps the principal reason why whole families are destroyed by this disease, by its being communicated from one to the other, is from being in constant contact with the consumptive.

Measles and whooping-cough, we all know, are very contagious; but, as these two diseases are not so dangerous to life, we will pass them by.

From what has been said, we know that these diseases, small-pox, diphtheria, scarlet fever, etc., do not originate in themselves. Every one affected with any of these diseases must have been in contact with the seeds of that disease. Knowing this, we can prevent the spreading of these diseases by destroying their seeds, and by preventing any one from coming in contact with them. For their restriction, it is necessary:—

1. That the health officer shall have notice of a contagious disease as promptly as possible.

2. The health officer should, as promptly as possible, have the assistance of every individual in isolating all affected with the disease.

3. All danger and sources of spreading the disease should be stopped, and all infected things should be destroyed, or isolated until freed from infection.

These measures are very seldom carried out, I am sorry to say. Children will be sick with an eruption for two, three or more days before a doctor is called, and by the time the health officer arrives, a great deal of mischief has already been done. People have a wrong idea. The majority of physicians are anxious to prevent disease. The local health officer is hired by the city or township to look after contagious diseases and to prevent their spreading; and the parents should call on him when they do not know whether their child is sick with a dangerous communicable disease, or another disease.

When diphtheria was epidemic here, the local physicians were not agreed at first, whether the disease was diphtheria or not; and the health authorities did not use the stringent methods from the beginning, that they should have done. Cases were not reported, nor isolated; and we all know the result. We had the disease with us for over a year and a half; while the surrounding towns, Grand Haven and Allegan, had none. Zeeland had two or three cases, all of which, I think, can be traced to this city. So, if the disease were not communicable, why should our neighbors escape. We live under the same climatic conditions. It was our neglect from the start, and we paid for it, the loss of which can never be estimated. The public must be educated that the lives of many children can be saved every year, if the proper precautions are taken. All of us are negligent, and are apt to say, "Am I my brother's keeper?"

There is a great amount of opposition against the health authorities in the minds of many, for interfering in the care of their sick. The spirit, "I want to do about this as I think best, and I am boss in my own family" crops out frequently.

It is not only necessary that all the people should coöperate in the prevention of communicable diseases, but it is absolutely necessary that the people know how to restrict them; and they can never do this unless they understand the manner in which these diseases spread.

In every contagious disease, there goes from the individual, something which will cause the disease in others, if fertile soil for its growth be found. For instance, in consumption the sputa from the lungs contain

the germs. Let these sputa be dried and become dust, as they will if expectorated on the floors of halls and assembly rooms, then these germs in the air may produce consumption in those who breathe the air. This shows how important it is that the sputa of consumptives should be destroyed or disinfected. Until this is done, every man, woman and child is in danger of becoming a victim to this fatal disease.

But, I do not want to appear here as an alarmist. I have faith in the people that they will pay more attention to these sanitary matters, as they understand them. Much good has already been done. Hundreds of lives have already been saved every year, by the efforts of our State and local boards of health. A great deal must still be done. Let us keep on in the good work, and always keep in mind the good work of the State Board of Health.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE OFFICE OF THE STATE BOARD OF HEALTH.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING.

In the brief time allotted to me to speak on this topic, you will hardly expect me to tell you all that is known to the State Board of Health, relative to the restriction and prevention of the dangerous communicable diseases; but I will try to state clearly and distinctly what are now considered to be the essential measures for the accomplishment of these important purposes.

But first let us consider what are the most dangerous communicable diseases. And how important are they?

I have here a diagram which has resulted from a study of the deaths reported to have occurred in Michigan from the dangerous communicable diseases during the twelve years, 1876–87*. Since this diagram was first made, one more disease, pneumonia, has come to be accepted by sanitarians as communicable. Pneumonia has, therefore, been inserted in its proper place, below diphtheria and above typhoid fever; and now the first five diseases named in the diagram are the five diseases which caused the most deaths in Michigan, during those twelve years. Now, if you once grasp the idea which the facts thus condensed teach, you will begin to realize the vast importance of the restriction and prevention of the dangerous communicable diseases. I beg you to consider that the five diseases which cause most deaths in Michigan are all dangerous communicable diseases, that they are all preventable diseases—that is to say, they are all diseases which can be restricted and prevented, and we already know how.

These five diseases are: consumption, diphtheria, pneumonia, typhoid fever and scarlet fever. The State Board of Health prints and distributes pamphlets telling how to restrict and prevent each of these most important diseases; and, in one little leaflet, has summarized the most important recommendations, which I here still further condense, as follows:—

*This diagram is printed on page 14.

SUMMARY RELATIVE TO THE MOST IMPORTANT DISEASES.

1. The most important measure for the restriction of consumption, is the disinfection or destruction of the sputa of every consumptive person.

2. The chief measures for the restriction of diphtheria are the complete isolation of every infected person and thing, and, after death or recovery of the patient, the thorough disinfection of every infected room and thing.

3. The restriction and prevention of pneumonia require the disinfection of all sputa, special care relative to ventilation of inhabited rooms, and special care to avoid exposure to cold.

4. The restriction and prevention of typhoid fever call for the disinfection of all infected excreta, care relative to all excreta, preservation of the purity of the drinking water, and the boiling of all suspected water for household use.

5. The restriction and prevention of scarlet fever are accomplished by the absolute isolation of all infected persons and things until after complete disinfection.

6. The rules for scarlet fever are applicable for the restriction and prevention of whooping-cough and measles, and also of small-pox; but for small-pox we have in vaccination and re-vaccination well-known preventive measures which should be so thoroughly employed by every person that restrictive measures would be unnecessary.

ISOLATION AND DISINFECTION.

You may have noticed that, in this subject of the restriction and prevention of the dangerous communicable diseases; there are two words which seem to be of supreme importance; those two words are *isolation* and *disinfection*. They are of such importance that it may be well to make sure that they are understood. The old word *quarantine* is now not much used; *isolation* stands in its place, to some extent; and isolation means the complete separation of the sick, or infected person or thing, from the public.

Isolation of infected persons and things, is the most important measure for the restriction of a few of the diseases which cause most deaths in Michigan; it is the most important measure for the restriction of diphtheria and of scarlet fever.

Disinfection means the destruction of the germs of disease.

After the death of a person sick with a dangerous communicable disease, or after complete recovery, before allowing the sick-room to be entered by any person who might contract the disease, or permitting the contents of the room to be removed, the room and contents, and all clothing worn by the patient while sick, and all other articles likely to have become infected, should be thoroughly disinfected. It is best to burn infected articles which are not too valuable. But such articles as bed linen, towels, etc., which can be so treated, should be subjected to a boiling-hot disinfecting solution. Clothing, carpets, bedding, and all contents of the sick-room should be fumigated, by burning sulphur at the rate of three pounds for each thousand cubic feet of space in the room.

All the different reliable methods of disinfection, applicable to the different dangerous diseases, are described in the several panphlets issued by the State Board of Health, and distributed in this audience, and I will not repeat them here.

DIPHTHERIA AND SCARLET FEVER.

What I wish to impress upon you, at this time, is the fact that such diseases as diphtheria and scarlet fever can be restricted by isolation and disinfection. I have here two diagrams in which conclusive evidence of this fact is graphically exhibited. Similar diagrams have been distributed in this audience, and I trust you will all examine them sufficiently to grasp the important fact which each diagram exhibits,—the fact that in those outbreaks in which isolation and disinfection are neglected there are about five times as many cases, and about five times as many deaths, as there are in those outbreaks in which isolation and disinfection are enforced. This is the general fact, which is true of scarlet fever, and also of diphtheria. This means that by thorough isolation of "first cases" and disinfection of all infected things, about four-fifths of the cases and deaths, from these two diseases, which otherwise would occur are prevented from occurring. It means that if such measures were enforced in every locality, these diseases would not occur at all; because what are now the "first cases" are brought into localities from other localities where the disease has been permitted to spread.

In Michigan, isolation and disinfection are of greatest importance with reference to the two diseases—diphtheria and scarlet fever; and by examing the diagram (Deaths in Michigan, 1876-87, page 14) you will see that they are among the very few diseases which cause the most deaths, and are, therefore, of most consequence to be studied and restricted.

TYPHOID FEVER.

Typhoid fever is another disease of exceeding great importance, because it causes so many deaths, and also because it causes about ten times as many cases of long-continued sickness as there are deaths. In every year, about ten thousand inhabitants of Michigan suffer sickness for weeks, and millions of money values are wasted, because of this dangerous communicable disease which we believe to be almost wholly, perhaps wholly preventable; because it is a disease believed to be propagated largely by the habit of our people of drinking water contaminated by the leachings of privy vaults. Probably typhoid fever is sometimes spread in other ways than by way of the privy vault and the well, because the germs are reproduced in the intestines, and may go wherever human excrement goes; therefore dust from filthy places may convey the germs of typhoid fever; but as a rule typhoid fever seems to be caused by drinking water into which has filtered water from some privy vault. Such water is usually without color, and cannot be ordinarily detected by the senses.

Here let me repeat what I have once said: The restriction and prevention of typhoid fever call for the disinfection of all infected excreta, care relative to all excreta, preservation of the purity of the drinking water, and the boiling of all *suspected* water for household use.

PNEUMONIA.

We have long known, that in Michigan, pneumonia causes more deaths than does scarlet fever or typhoid fever; but it is only within a few years that pneumonia has come to be known as a dangerous communicable disease. This now seems to be well established, and the disease has lately

assumed unusual prominence because of its association with epidemic influenza, and because the death-rate from pneumonia has been so greatly increased.

Much remains to be learned concerning the modes of spreading the disease, but we already know that the germs of the disease are present in the sputa, and that the careful and thorough disinfection of the sputa is of very great importance.

CONSUMPTION.

Lastly, I will speak again of that disease which, throughout the world, is *the* great destroyer; and which has been graphically called "the great white plague." Consumption causes more deaths than does any other disease in Michigan. It is the most dangerous communicable disease. But it is probably one of the easiest diseases to restrict, now that we know how. However, no person can fully protect himself. Here man is his brother's keeper, and no man can live to himself alone. Under present conditions the germs of the disease are, frequently, scattered about in assembly rooms, churches and other places, which all of us visit; therefore we may contract the disease in public places, even though in all places which we control the conditions may be such that the disease will not be contracted. It is greatly to the interest of all, that there shall be such a general spreading of the knowledge of how to restrict consumption that every person shall know how to act for the restriction and prevention of this most important of all diseases.

Because of the importance of the disease, I will here repeat: The most important measure for the restriction of consumption is the disinfection of the sputa of every consumptive person.

It should be understood that, in the early stages of consumption, few persons are willing to admit, to themselves even, that they have consumption; therefore whoever has a cough, and raises sputa, should, by all means, thoroughly disinfect or destroy the sputa.

In this presentation of the subject, I have dwelt only upon the salient points of five diseases; but they are the five diseases which cause most deaths in Michigan; and if the people of Michigan will only do what has here been mentioned, as the recommendations of the State Board of Health, what are at present the principal causes of deaths in Michigan will, in great part, disappear, and thousands of our people now living, who otherwise would die untimely deaths, will continue on to a healthful old age.

THIRD SESSION, MARCH 4, AT 2:30 P. M.

The convention was called to order by the president. Miss Stephens entertained the audience with a piano solo.

ALCOHOL AND NARCOTICS IN HEALTH AND DISEASE.

BY PROF. G. J. KOLLEN, HOPE COLLEGE, HOLLAND.

Mr. Chairman and Gentlemen of the Convention: In considering the subject on which I was asked to prepare a paper, I met with many difficul-

ties, and well-nigh insurmountable obstacles. First, and prominent among them, stood that defiant giant, a regular Goliath, Ignorance. When, however, provided with a suitable sling, and a goodly number of smooth stones, when hope and courage, in grand anticipation, made the future victory almost a present realization, I, one day met our genial president, who, prompted by his usual concern for those whom he considers in trouble, asked, how my paper was advancing. I innocently told him that the matter for it had all been stored up, and that all that was needed was a little rearranging of things, and that then it would be ready for the permanent mold.

"But," said the kind president, with a sympathetic smile upon his countenance, "have you a record? Have you, from time to time, drank enough alcohol to change the wet, dirty gutter into a soft and comfortable bed, and to change all objects about you, animate and inanimate, into so many hissing serpents and snapping dragons?" "This," said the worthy president, with a fatherly voice and a patronizing demeanor, "is the requirement of all who speak or write upon such a subject."

I began to suspect that my appointment was nothing but a huge hoax on the part of the medical fraternity. I became strengthened in my suspicion because the genial Secretary of the State Board of Health flooded me with literature upon this great subject. I concluded that his good nature was getting the better of him, and that prompted by profound pity, he then sought in a measure, to bring relief.

A layman was suddenly cast into the midst of the medical profession, and I was in too deep water. Could I have gradually waded into it, I might perhaps have learned to hide my ignorance and mistakes, under, as it were, six feet of earth.

I became the more bewildered because my authorities on the subject were not agreed; and, to my surprise, they were not only not agreed, but they were frequently fierce combatants. I knew that, in the dark ages, men entertaining different views on the theological points, waged war against each other, and made the language common: "There is a heretic, Burn him," "there is a man who has gone off the road, bring him back and torture him;" but we would hardly expect that in this last decade of this enlightened century, men, in search of scientific truth, should spend so much of their strength in fighting all who seek for truth along a different line from themselves.

The fact that even today there is so much fighting of men instead of error; and that scientific and professional men are often more in love with their own preconceived notion than truth, is a sad obstacle in the way of the progress of knowledge.

Truth, whether we consider it as an abstract or a concrete, is found without ourselves. That is to say, we can not evolve it from our own consciousness. It is not a mere creature of our imaginings, or the product of our own intellectual efforts. It is something outside of us with which the mind becomes acquainted through the senses as media. It is therefore plain that if we wish to see truth in its purity as bearing upon questions of such vital importance that the mind must be unprejudiced and the media in a healthy condition.

"Truth is not a product of the intellect alone; it is the product of the whole nature. The body is engaged in it, and the mind, and the soul."

The body is engaged in it. Of course when a man is subject to dyspepsia and billiousness, things around him become unusually black—his eyes

are blurred, and his vision distorted. So when a man is steeped in alcohol, when his hands tremble and his feet totter, the functions of the body are no longer able to discharge their duties. And how true is this of that more delicate organism, the intellect; and of our moral nature, which makes us the connecting link between the divine and the material. We may therefore safely conclude that whenever any part of man is in an abnormal condition, the whole machine becomes disordered. So when a man takes up in his body anything whereby his faculties are blunted, and his powers weakened, he is no longer able to engage in valid reasoning and draw proper conclusions.

It is therefore evident that we can not look to the drinking man for a solution as to the question of the effect of alcohol upon the human system. Such an one looks at truth through defective spectacles; and, instead of seeing the truth he only sees a piece of colored glass.

Then, shall we let the physician speak on this subject? Certainly, if anyone, he knows. Now it seems that the best and most reputable physicians are agreed that alcohol in any form, or combination, is not required by the system, but on the contrary if taken in even small but oft repeated doses, produces unpleasant and pathological effects, which show themselves in many forms of disease, which frequently end in premature death. But the drinking people say that physicians are biased in their judgments, and that all moralists on this subject are cranks.

There is yet one argument, outside of those advanced by professional men, which, for want of a better term, we may call the business argument. It would seem that even a half sane person would have to accept an argument from such a source, seeing it is based upon figures, which in this case cannot be said to lie. We have reference to the rules governing life insurance companies. It is an indisputable fact that there is not one reliable life insurance company that will insure, at regular rates, a man who habitually or quite regularly drinks, even beer, let alone stronger liquor. Why do those companies so strenuously insist upon the strict application of this rule? Is it a question of principle or morality with them? Why no, it is merely to them a matter of business. The fact is that the "expectation of life," according to the most reliable statistics, of the tippler, is shorter than that of an abstainer. If any tippler doubts this statement let him try to insure with the North Western or the Mutual Life of New York, and he will learn that these companies consider his life too poor a risk than that they will risk any money upon it. The use of spirituous liquor is therefore not only injurious to health, but to life as well.

But sadder than this suicidal aspect of the drinking habit is the evil which it often entails upon innocent children. Hugner Le Roux, in a very interesting article in one of our magazines, upon "Phases of Crime in Paris," states that Dr. Paul Garnier, an eminent physician, and chief medical officer of the Prefecture of Police of Paris, after an experience of sixteen years says, that the progress of alcoholic insanity has been so rapid that the evil is now twice as prevalent as it was fifteen years ago. Almost a third of the lunacy cases observed at the Depot Infirmary are due to this disease, and every day it declares itself more violently, and with a more marked homicidal tendency. The accomplice of two-thirds of the crimes committed, upon whom the criminals themselves throw the responsibility of their evil deeds, and whom the police never succeed in discovering, exists. That accomplice is alcohol! It visits upon the child the sins of the father, and engenders in the following generation homi-

cidal instincts. During the last ten years the criminal type has entered on a new phase. Before that date the assassin was generally a man in the vigor of his strength and manhood, he had tasted life in all its forms. Nowadays it is the youth of barely twenty who murders. The jurymen hesitate to condemn him on account of his youth, although they are horrified at his cold-blooded ferocity, and at the absence of moral sense which he displays. As a rule, the "hereditary alcoholist" is not only very obstinate but very intelligent. He shows great skill and shrewdness in the planning and execution of his crime, and afterward, when he is taken, in the defense of his life. And it is claimed that these young criminals are utterly devoid of affectionate emotion. Le Roux says: "In order to shed a stronger light upon this type of youthful criminals, born of drunken parents, I will mention a case chosen from among many others, which seems to me characteristic of the appaling insensibility that turns into brute beasts a multitude of men.

A few months ago I was present in Dr. Garnier's consulting-room, watching the prisoners filing past. We were informed that a child had been brought by its parents to be examined. These people were shown in; they belonged to the respectable working class, and were quiet and well mannered, the man was the driver of a dray belonging to one of the railway stations, and had all the appearance of a stalwart workingman. The boy was barely six years old; he had an intelligent, rather pretty face, and was neatly dressed.

"See here, Monsieur le Docteur,' said the father, 'we have brought you our boy; he alarms us. He is no fool; he begins to read; they are satisfied with him at school, but we cannot help thinking he must be insane, for he wants to murder his little brother, a child of two years old. The other day he nearly succeeded in doing so. I arrived just in time to snatch my razor from his hands."

The boy stood listening with indifference, and without hanging his head. The doctor drew the child kindly toward him and inquired: "Is it true that you wish to hurt your little brother?" With perfect composure the little one replied: "I will kill him—yes, yes—I will kill him!" The doctor glanced at the father, and asked him in a low voice: "Do you drink?" The wife exclaimed indignantly: "He, sir! Why, he never enters a public house, and has never come home drunk."

They were quite sincere. Nevertheless the doctor said: "Stretch out your arm." The man obeyed; his hand trembled. Had these people told lies, then, in stating that the man had never come home the worse for drink? No, but all through the day, wherever he had called to leave a package, the people of the house had given him something to drink for his trouble. He had become a drunkard without knowing it; and the poison that had entered his blood was at this moment filling the head of his little child with the dreams of an assassin."

The question is how far education can alter so depraved a nature. Experience proves that it is much the same with these moral deformities as with the physical deformities of rickety children. After miracles of treatment, after painful operation, after the torture of orthopœdic apparatus, the surgeon shows you with pride comparative photographs representing the little patient at intervals of some years. The curved bones have been straightened, the rigid muscles have been snapped, but the child remains after all a weakly creature.

As to the usefulness of alcohol in *disease,* I am not competent to judge.

It would seem, though, that as a stimulant it might hold an important position in the materia medica. It seems to me the height of folly to refuse it such a position simply because it is so generally used to one's injury. The abuse of anything does not decide against its usefulness. Because my neighbor has seen fit, by means of an overdose of strychnine, to take his life, it does not follow that when I am sick a proper dose cannot be beneficial to me.

It seems to me that the use of *narcotics*, when the body is in health, in a normal condition, can only work injury, because it throws the complicated human machinery out of equilibrium. But when the body is diseased, and the sympathy between the mind and the body becomes so strong, that the suffering of the one leads to the worry of the other to such an extent that reason has in a measure lost its controlling power, then I consider the judicious use of the soothing opiates of incalculable benefit. Narcotic, when properly used, is one of the greatest blessings wherewith a kind Providence is providing us in nature; and mankind owes a debt of gratitude to the scientist who has made us acquainted with this agent.

We know of no sensible use of the narcotic, tobacco, either in health or in disease. Its use seems to make the well sick and the sick sicker. Time would not allow me to enlarge on this part of the subject, for with reference to it I have "a record," a bad, black, shameful record, which record has only one redeeming feature, which is that about thirteen years ago the habit of the use of the weed yielded to a most complete reformation. These have been thirteen years of probation, when I have continued faithful to my vow. But even now the foul habit will at times come in the quiet of the night and disturb me in my sleep; and in my dreams I have sometimes yielded to the fiend; but I can also say that even in my dreams I abhorred myself for not being able to withstand the temptation. I pity the man who is shackled by such a habit. I sympathize with the man who throws off the yoke and stands before the world cleaner than he was, and better fitted for respectable society.

ALCOHOL AND NARCOTICS IN HEALTH AND DISEASE.

BY PROF. DELOS FALL, M. S., MEMBER OF THE STATE BOARD OF HEALTH, ALBION.

Mr. Chairman, Ladies and Gentlemen—I am very glad to have come here this afternoon and join with one who so thoroughly expresses my sentiments, and with one who is also a fellow teacher. I cannot speak from experience as has my friend who has just preceded me. I thought that it was one of the president's jokes when he announced that Prof. Kollen would not speak of his personal experiences, but would read some of the results of his researches on the subject. His experiences, however, have not gone as far as those of many men and yet these have been serious enough to convince him that there are some things in this world that might better be left entirely alone.

This subject may be studied from various standpoints: The public-spirited citizen desirous of maintaining law and order in the town or city in which he lives may find a proper channel for his enthusiasm in advocating the strict enforcement of the laws as they now exist, or he may believe in and strenuously work for local option or the total prohibition of the traffic in intoxicating liquors. He may believe that in the political

field this great problem will find its solution and being a man of convictions he labors to that end.

But I believe that another and perhaps more fruitful field for final success in this direction lies in the scientific presentation of the evil effects of alcohol and narcotics on the human system as contemplated in the law of our State which compels the teaching of this subject in all our schools; and I say all honor to Mary Hunt and her noble co-laborers who by their efforts and influence have so forcefully brought this important subject before the minds of our boys and girls.

There is great need for teaching on this subject. Men of learning are not agreed as to the exact place and mission of alcohol in this world. Not many I think will agree with the view which the eloquent Robert Ingersoll takes of the subject as evidenced in this clipping made from the Michigan Christian Advocate of February 27, 1892. More will agree with Dr. Buckley's paraphrase of the letter. The eloquent infidel wrote a letter to a friend as follows:—

"I send you some of the most wonderful whisky that ever drove the skeleton from the feast or painted landscapes in the brain of man. It is the mingled souls of wheat and corn. In it you will find the sunshine and shadow that chased each other over the billowy fields, the breath of June, the carol of the lark, the dew of night, the wealth of summer and autumn's content, all golden with imprisoned light. Drink it, and you will hear the voice of men and maidens singing the 'Harvest Home' mingled with the laughter of children. Drink it, and you will feel within your blood the startled dawns, the dreamy, tawny dusks of perfect days. For forty years this liquid joy has been within staves of oak, longing to touch the lips of man." Dr. J. M. Buckley, of the *Christian Advocate*, changes the wording to: "I send you some of the most wonderful whisky that ever brought a skeleton into the closet, or painted scenes of lust and bloodshed in the brain of man. It is the ghosts of wheat and corn crazed by the loss of their natural bodies. In it you will find a transient sunshine chased by a shadow as cold as an arctic midnight in which the breath of June grows icy, and the carol of the lark gives place to the forboding cry of the raven. Drink it and you shall have woe, sorrow, babbling and wounds without cause. Your eyes shall behold strange women and your heart shall utter perverse things. Drink it deep, and you shall hear the voices of demons shrieking, women wailing, and worse than orphaned children mourning the loss of a father who yet lives. Drink it deep and long, and serpents will ring in your ears, coil themselves about your neck, and seize you with their fangs, for at last it biteth like a serpent, and stingeth like an adder. For forty years this liquid of death has been within staves of oak, harmless there as pure water. I send it that you may put an enemy in your brains. And yet I call myself your friend."

You may call this sentiment, but to me it is the awful truth.

Now if anyone has any enthusiasm for any phase of the temperance reform, let him work it out on the line where he thinks he can do the most good. As I have said I look with the greatest hopefulness to the work which can be done with our boys and girls in school, so, that, by judicious teaching, the next generation of men and women shall have correct, scientific ideas which shall lead them intelligently to guard against the evils incident to it. Can the real, the scientific reasons why alcohol has such a blighting effect on the human system be clearly understood by the

pupils in our schools? I think it can; and the remainder of the time allotted to me for this discussion, I desire to illustrate how it may be done.

But before proceeding with the subject certain conditions ought to be insisted upon which, according to my opinion, are quite essential to the proper enlistment of the scholars' interest in the subject:

(1) The teacher must lay aside all sentiment, both in manner and in words. This subject demands the same cold, critical, scientific treatment that every other question in science receives. For the teacher to have it known that he treats this subject simply from the standpoint of a political prohibitionist or ardent temperance worker would be to so prejudice the work as to largely destroy the results which are aimed at.

(2) On the other hand, the scholar himself must have passed beyond that stage of his observation of the results of rum's doing that simply makes sport of the drunken man, deriving pleasure and making such a man serve as the occasion for fun and frolic. It would be well if the scholar should set himself the task of seriously and carefully observing for himself those facts which are apparent when he comes face to face with one of the victims to the alcohol habit. Let the scholar note, then, the staggering gait, the rolling eyeballs, the bleared and blood shot eyes, the voluble tongue, the rum-blossomed nose; the loss of judgment, of honor, of purity; the drunken stupor, etc., etc., and with his mind full of these facts he will be in a condition to heartily appreciate the work set before him.

What is the action of alcohol on the system?

This question naturally divides itself into two parts which must be treated separately.

The first concerns those investigations which will make plain the merely physical action of alcohol on the body; the other those considerations which reveal the value of alcohol as a food.

ALCOHOL MAY BE INTRODUCED INTO THE SYSTEM

in several ways; it may be injected through the skin, it may be inhaled by the lungs, or it may enter the stomach by means of the mouth. By all these methods the alcohol will finally make its way into the circulation and by it be distributed to every part of the body. If injected under the skin or into a vein it is quickly absorbed by the minute lymphatics and by them passed into the circulation at the point where the great vein from the arm, the subclavian, joins the vein in the neck, the jugular, thence into the descending vena cava, and onward into the heart.

If the alcohol is in a state of vapor and inhaled by the lungs, osmosis quickly takes place, and the alcohol passes from the air-cells into the pulmonary capillaries and is by them conducted to the pulmonary veins, and thus on to the heart.

But the usual avenue of ingress into the body is by way of the mouth and stomach. Portions of the alcohol are here quickly absorbed by the dense matting of blood capillaries lining the mucous membrane of that organ and by them passed in to the great portal vein leading to the liver. Passing through this it makes its way into the ascending vena cava, the right heart, the lungs, back to the left heart, and thence through the aorta and its divisions into all parts of the body. Thus it is seen that this fluid finally comes in contact with every organ of the body, it bathes every tissue, it lays tribute upon every nook and cranny of the human system.

Having now studied the course of the blood and hence the alcohol through the system, let us pass on to inquire as to the effects which are produced on the various tissues and organs with which it comes in contact.

ACTION ON THE BLOOD.

Plainly among the first things to be influenced will be the blood itself. If the alcohol is in small quantities it may be diluted to such an extent by the large percentage of water present in the blood as to render it powerless to affect any visible change in the blood. But its effects when in large quantities, as it exists in the blood of the confirmed drunkard, are well-known.

In order that we may clearly understand what this action is we must recall the structure and component parts of human blood.

It will be remembered that the blood on first examination is seen to be composed of a clear, watery fluid, the plasma, and floating in this, myriads of small, round, biconcave bodies, the corpuscles. The plasma is in turn composed of albumen, fibrine,—which aids in the process of coagulation—fatty matters and salts of several metals. Now, various experiments have been made, such as administering alcohol to a frog and observing the effect on the blood as seen in actual circulation in the web of the foot, or withdrawing blood from the veins of a man in the state of intoxication; so that the pathological effects are well known.

The action of the alcohol upon the corpuscles is very striking. It may cause them to roll together closely and continue to adhere, a condition never seen until the blood has begun the process of coagulation.

Here is our explanation for the sluggish flow of the blood in the capillaries of the drunken man, the corpuscles not being able in the closely adhering rolls to make their way through these minute circulatory organs.

Moreover the corpuscles are seen to have their outlines modified, making their smooth and regular outline to be wrinkled and the whole form star-like. These changes are brought about by the power which alcohol has of absorbing or extracting water. We are familiar with the power which a sponge possesses of accommodating great quantities of water between the particles of its own structure. A cloth or piece of paper will do the same. We are not so familiar with the same effect produced by a liquid, but alcohol and some other liquids possess it in a high degree. It is on this principle that specimens for our museums are preserved, which otherwise would be perishable on account of the large amount of water they contain. They are plunged into a jar of alcohol, the water is thereby withdrawn and the specimens preserved. We are now prepared to clearly understand one action of alcohol on the system, viz., alcohol withdraws water from the blood corpuscles and thus shrinks and hardens them, rendering them wholly unfit to carry out their natural functions of absorbing oxygen and conveying it to the various tissues of the body.

Right here let me utter a word of caution. I once had the pleasure of discussing this subject before a splendid body of teachers at an institute held in this county. I remember the advice there given to the effect that the illustrations which we bring to throw light on the case or the experiments we perform shall not exaggerate the real case in hand. For example, the child is taught that the brain of man is albumenous in its nature and to illustrate the effect of alcohol on it, pure alcohol is poured upon the albumen found in the white of an egg. The egg is coagulated, and so is the

man's brain, but not to the same extent else the man would lose the use of that organ entirely. The alcohol which the man drinks is largely diluted, and so ought the alcohol, taken for the experiment. In the same way the child could be taught the effect which alcohol would have on all the organs of the body, and gradually he would come to have a clear understanding of the hob-nailed or gin-drinker's liver, the fatty heart, the ulcerous stomach, the dropsical abdomen, the poisoned kidneys, the congested lungs, etc. But our time this afternoon makes it altogether impossible to more than mention the names of diseases often the direct result of drunkenness, —dyspepsia, jaundice, emaciation, corpulence, dropsy, ulcers, rheumatism, gout, tremors, palpitations, hysteria, epilepsy, palsy, lethargy, appoplexy, melancholy, madness, delirium tremens, premature old age, etc., etc.

Is there any compensation for all this? I have reserved for myself a part of my time for the discussion of this question. The question is sometimes answered in the affirmative. When so answered it has been on the basis of the statement that in all alcoholic beverages there is a certain amount of nutrient matter, that is, that alcohol is a food.

IS ALCOHOL A FOOD?

This brings us to the very heart of our subject, the pivotal point around which the great discussions have raged. All have conceded that dire and dreadful results have always flowed from an excessive use of alcoholic drinks; but after all is there not a moderate use of them possible, so moderate that the beneficial results will more than compensate for the few evils which necessarily accompany them?

In order to prepare ourselves for the discussion of this subject it will be necessary to briefly review the character and uses of food. The various foods we use may be primarily divided into inorganic and organic. The former will include those few mineral matters which the body of man seems to have the power to assimilate, such as water, common salt, salts of calcium, magnisium, potassium, etc. Organic foods may be divided into three classes, the albumenous, such as the white of the egg or the fibrine of meat, the saccharine or the starches and sugars, and the oleaginous or fats and oils. If we go further and consider their chemical composition we notice that while the saccharine and oleaginous foods contain but three elements, viz., carbon, hydrogen, and oxygen, the albuminous foods all contain a fourth element, nitrogen. This permits another classification and one which it is very important for us to remember. The organic foods are divided chemically into two classes (1) the nitrogenous including the albuminous food and (2) the non-nitrogenous, including the saccharine or the sweet foods, and the oleaginous or fat foods. Every particle of food, then, which we daily pass into our mouths,—bread, butter, meat, potato, pie or cake, all contain some nitrogenous and some that is non-nitrogenous.

THE USES OR FUNCTIONS OF THESE FOODS.

As alcohol is clearly of organic origin it will, for our present purpose, only be necessary to ask after the uses of the organic foods. These foods then are introduced into the body for three general purposes, viz., (1) to build up tissues and repair waste, (2) to produce heat, and (3) to produce energy. But since heat is only a form of energy we may combine the two uses last mentioned into one and condense our statement into this: food is

anything which is needed in our bodies for the two general purposes—tissue forming and energy producing. Take notice, however, "that to the above definition should be added this important condition that, neither the substance itself nor any of the products of its chemical transformation in the body shall be injurious to the structure or action of any organs, otherwise it would be a poison not a food."* In the light of these definitions let us examine alcohol. First, then,

CAN ALCOHOL BUILD UP TISSUES?

We answer that in the case especially of the more important tissues, nervous, muscular and glandular, alcohol cannot contribute to their growth. The reason is a chemical one but I trust this will not discourage you from fully appreciating it in all its force. The chemistry involved is very simple and can be grasped with ease by all. The briefest statement of the argument is, alcohol cannot build up muscular, nervous or glandular tissues, because it contains no nitrogen. These tissues are nourished mainly by the nitrogenous or albuminous food. Alcohol contains only carbon, hydrogen and oxygen,—its chemical formula being $C_2 H_5 O H$. What are these tissues? They are those which contribute the forces and activities to the body, the capability of motion either of the body as a whole or any of its parts. What is the secret of their forceful nature? The secret of their forceful nature is the nitrogen which they contain. Remembering that chemical action and chemical principles are the same everywhere we may borrow an illlustration from inorganic chemistry to throw light on the statement just made. Gunpowder as you know is a mixture of charcoal, sulphur and potassium nitrate or saltpetre. In this mixture the charcoal and sulphur are used because of their easy combustibility, the saltpetre because it contains a large quantity of oxygen and also because the oxygen is in combination with nitrogen. This latter element is weak in its power to attach itself to other elements and when so combined its inertness renders it very willing to part company with them; that is to say, any compound containing nitrogen tends to be easily broken up. If now there is also present other elements which when first separated and then recombined produce large quantites of gaseous compounds and if these gases be confined so that they cannot freely escape, the result will be that great force or energy is developed. This in brief is the explanation of the force exerted by gunpowder. Now, muscle and nerve must possess some of the properties of this gunpowder, that is, in order that the processes of disassimilation and assimilation shall go on rapidly they must be so constituted that they are easily and quickly decomposed and they must also be of such a nature as to yield a large amount of oxygen. The point I wish to emphasize and call particular attention to is that the initial movement for the whole series of phenomena is due to the nitrogen present; gunpowder, dynamite, nitro-glycerine contain nitrogen and hence their forceful nature. Muscle, nerve and gland contain nitrogen and hence their power to set into being those forces which give to the human body life and activity. I think we can now fully appreciate the weighty argument contained in the statement that alcohol contains no nitrogen and hence can not build up these tissues. We must go farther however before this argument is complete. Do not these tissues contain carbon, hydrogen and oxygen and may not alcohol

* Martin's Human Body, Advance Course, p. 298.

contribute these while the nitrogen is drawn from some other source? Just here must be brought into view a fact in regard to the human body which is well known by physiologists and which compels us to answer the question in the negative. The fact here alluded to is

THE LIMITED CONSTRUCTIVE POWER OF THE HUMAN BODY.

Plants have marvelous constructive powers, they being able to take the elements as combined in minerals or uncombined as the case may be and work them over, thus reconstructing them into likeness with their own tissues. Not so in the animal world. Animals must have their food already prepared in that form which if not exactly like their own tissues is yet so near that it comes within the limit of their feeble powers to metamorphose them. The human body cannot, then, break up alcohol and recombine the elements into nerve or muscle or gland. In order that to the product of our own reasoning on this point and the conclusion we have come to, there may be added the weight of some high authority on the subject, I will quote from Dr. Richardson, the great English experimenter and investigator on this subject. He says, "Alcohol contains no nitrogen, it has none of the qualities of the structure-building foods; it is incapable of being transformed into any of them. It is therefore not a food in the sense of it being a constructive agent in the building up of the body." He adds this significant statement: "In respect to this view, there is, I believe, now no difference of opinion among those who have most carefully observed the action of alcohol." *

But it is said that "beer drinkers grow fleshy." Yes it is true that although alcohol cannot contribute to the growth of tissue it does have the baneful power of changing otherwise healthy tissue into an unnatural fatty material and depositing in places altogether abnormal and decidedly prejudicial to the welfare of the body. It changes the connective tissue of the heart, for example, into fat and hence results in the well known disease,

FATTY DEGENERATION OF THE HEART,

which finally produces death. I cannot now stop to discuss this phase of the subject but will dismiss it with the well known scientific statement that fatty degeneration of tissues and the deposit of this fat in unnatural places frequently, if not always, accompanies the use of alcohol.

Besides, there is a converse side to this question which has already been incidentally brought out and that is that not only is alcohol not itself digested and assimilated but it coagulates the albuminous foods and in this way retards the digestion of these important food elements. In fact there is no disease more frequently brought to the attention of practicing physicians than is drunkard's dyspepsia. Indigestion is an almost universal accompaniment to the alcohol habit.

Still again let us try alcohol by some of the general tests for food and because I find them stated exactly as I want them in that splendid work on the subject, lately published, Gustafson's "Foundation of Death," p. 68. I quote his words:—

"1. The regular foods are essential to life. It is positively proved that alcohol is not essential either to life or health.

* Ten Lectures, p 100.

"2. The periodic need felt for regular foods ceases each time after being moderately supplied; even the momentarily importunate demand (caused by some special want), when satisfied, also ceases, or, if satiated or persistently denied, may even change to aversion.

"With alcohol, the desire, if steadfastly denied, will gradually cease, but if satiated, it begets abnormal craving, and the craving, having once taken hold, becomes the most insatiable of human passions. As Linnæus said, 'Man sinks gradually by this fell poison; first he favors it, then warms to it, then burns for it, then is consumed by it.'

"3. Regular foods, when taken in their proper ratio, are easy of digestion, and give the system a calm increase of vigor. Alcohol deranges digestion and disturbs the action of nerve-tissue."

This author adds, "To judge from these tests, therefore, alcohol is not only not a regular food, but, if used as such, acts as a poison."

There still remains one important inquiry concerning the food value of alcohol.

IS ALCOHOL A HEAT OR ENERGY PRODUCER?

If we should make the appeal at this point to those who use alcohol in any amount the testimony would be almost universal that it was capable of producing heat which is felt at once and is unmistakable. We meet here one of the most deceptive phases anywhere to be noticed in connection with this subject. We have already seen how the capillaries are distended with an unusual amount of blood producing a congested and inflamed condition. This is especially true of the capillaries of the skin. Here in these capillaries it is that evaporation is possible and here it is that the nerves of the temperature sense are located.

Two results follow from this condition:

1. An unusual amount of heat is required to carry on this evaporation, which heat is drawn from the interior of the body. The temperature of the body as a whole, therefore, is lowered instead of raised.

2. This heat thus escaping to the surface there comes in contact with the temperature sense nerves, and produces that glow of warmth which is so quickly manifest on the face and skin as soon as alcohol has been taken. It is an increase of heat only on the surface and that but for a short time and at the expense of internal heat. This is very significant when we remember that "the functions of life are greatly affected by even slight thermal changes, and only a few degrees below the normal will extinguish life; therefore anything which causes great fluctuations in bodily heat is dangerous to health and life." *

But, we must still inquire, may not the alcohol be oxidized in the interior of the body and thus be a source of heat? It is a familiar fact that the temperature of the body is maintained by the union of the oxygen with the tissues, these tissues serving as the fuel for the production of bodily heat. Alcohol, as is well known, is a highly combustible substance and may it not serve as the fuel? Just at this point the scientific world is divided, some maintaining that the alcohol is broken up and others that it passes through the body unchanged. We must examine both aspects of this question. That not all the alcohol introduced into the system is changed is proven by the well-known and characteristic alcoholic fumes

* Foundation of Death, p. 95.

escaping from the drunkard's body through the exhaled breath, his skin and by other channels. A certain amount of alcohol has been found in various parts of the body of persons who have died in an intoxicated state.

John Guthrie in his Temperance Physiology quotes the following from the statement of Dr. William Beaumont as to a post-mortem examination:—"I dissected a man who died in a state of intoxication after a debauch. The operation was performed a few hours after death. In two cavities of the brain, the lateral ventricles, was found the usual quantity of limpid liquid. When we smelled it the odor of whiskey was distinctly perceptible, and when we applied the candle to a portion of it in a spoon it actually burned blue. The lambent blue flame characteristic of the poison playing on the surface of the spoon for some seconds."* Of this alcohol thus passed unchanged into all parts of the system we say that even if it had no poisonous or evil effect on the various tissues and organs it still would be an evil as being so much foreign matter occupying the place which should be filled by nutrient matter and sound tissues, in this way acting as a clog or hindrance to the normal operations of the system. But we have seen that it is extremely poisonous to everything with which it comes in contact. Suppose we found that the bread or potato we were eating passed through the system unchanged, that the digestive juices were incapable of decomposing them, how long would it be before we should reject them from our dietary? Especially would we do this if we found that they were both indigestible and poisonous. If on the other hand we grant that much of the alcohol is oxidized, it can scarcely be said to mend matters very much. Looking simply at the necessity existing for maintaining the bodily temperature at a fixed point and finding that alcohol served as fuel to produce that temperature, one would be inclined to say that here at least we find this liquid performing a useful office for us. There is a fact, however, which lies behind this oxidation and heat production which must be considered. Oxidation takes place not alone that heat should be developed but also in order that by this process old tissues may be removed to make way for the assimilation of fresh food material, the health and activity of the body depending upon the processes of disassimilation and assimilation following each other in rapid succession. We live well only as we daily and momentarily die well. Tissues can only be quickly built up as they are quickly removed. Now the agent for this removal is oxygen; the process, oxidation or burning. We are now prepared to state the strong argument against claiming any food value for alcohol, viz., if oxygen is used to burn alcohol, some tissues which ought to be removed from the system will fail to be so removed for want of that oxygen.

The explanation of many conditions of the drunkard's body are now made clear to us; the bloated condition, the weak and flabby muscles, the blood-shot eyes, the discolored skin, the putrid breath, the sickening emanations from his entire body, all are indications of the awful condition of his entire system due to the withdrawal of the efficient and necessary oxygen from its legitimate work of removing waste and worn out tissue.

Here are some of the conclusions which we have reached in this discussion:

1. It deranges and oftentimes destroys the blood corpuscles.
2. It coagulates the albumen and fibrine of the blood.
3. It paralyzes the organic nerves distributed to the blood capillaries and produces congestion and stagnation.

* Foundation of death, p. 93.

4. It destroys the natural functions of every organ in the body.
5. It gives rise to an almost innumerable train of evils and diseases peculiar to the alcoholic habit.
6. It cannot build nervous or muscular or glandular tissue.
7. If it does produce heat and energy it thereby leaves unburned tissues in the system that ought to be removed.
8. It unfits the system to endure cold as its use in the end decreases the bodily temperature.
9. It equally unfits one to endure the heat of summer; and hence,
10. It is a poison.

DISCUSSION.

Dr. Mabbs.—I wish to ask Prof. Fall if he finds that there is much variance in the teaching of this subject in our public schools, and if it is taught according to the best authority, and according to the opinions of the best medical men?

Prof. Fall.—We have been taking great pains in this State to see that the best text books are used. I do not think that there is much variance in authors, and there is no danger of teaching the subject too much.

DISPOSAL OF WASTE AND EXCRETA IN HOLLAND.

BY J. A. MABBS, M. D., HOLLAND.

The committee that arranged this program gave me a very unsavory subject, and I see that our worthy president is very much pleased over the fact. I mean to speak plainly and I hope that no one will take what I have to say to themselves alone, and that no one will take offense at what I have to say.

To simplify and make use of plain terms will be the object of this paper, so as to be better understood by the non-professional listeners.

The subject is better defined by asking:—"What waste matters have we in Holland, that need our attention, and what is excreta?"

Waste may be considered anything found upon the surface. For instance:—It is the unsavory condition of our neighbor's back yard, now that the snow is gone, to many of us; the unpleasant smell of some of our meat markets in summer would suggest some waste during the year; the material on our streets that needs the constant attention of our commissioner, in order to keep it removed, waste paper, etc.; the material from our tables, thrown out; all old rubbers, shoes, etc.; and the contents of our cess-pools may be safely considered waste.

Waste, according to Webster, is anything lying unused, unproductive, valueless, as refuse or rejected matter. A thing we may safely speak of in this connection is the dust in our wood-working shops. I am glad to know, however, that there is more done to prevent men from breathing this dusty air in Holland than in some other places. It might not be amiss to call attention to the material that is being deposited in the head of our bay. Presumably a large part of it is washed from the marsh above, but it is also in a great measure due to the waste washed down from the tannery; and, if it could be precipitated before flowing into the bay, it would be a desirable thing, for as it now is, it will make a cess-pool at the outlet of Tannery Creek. Understand, it is not spoken in any desire to hamper

one of our best industries, or to "Kill the goose that lays the golden egg." I only ask if such things may not be done, to draw out discussion. It is an easy matter to condemn a thing, but quite another to suggest a remedy.

The one thing looked upon with most distrust by all sanitarians is the plan of putting in so many cess-pools, as we are now doing. All public buildings and many private dwellings are constructed with a system of sewage connected to it. We will ask, what shall we do? I can see no other way so easy and inexpensive. But, to look at the other side of the question; what will be the result of continuing such faulty construction? A saturating of the soil to such an extent that good drinking water will be a thing of the past; and still farther, there will be a pollution, and an actual percolating into our cellars, as is now the case in New York City. But, what we are going to do will be considered later.

Although you may say that the refuse from our tables does not amount to anything, still, when we consider how many there are in the city, you will know that it would fill our scavenger wagon, and more to, every day. What do we do with it? Many have some pigs, or a cow, for we are a thrifty people and do not believe in wasting anything. I am sorry to say that our butchers will persist in selling us bones in our meat, and they are often left kicking about in the yard until the small boy sees a few cents in them, and off they go to the junk dealers. It is better to burn them at once, together with all other uneatable portions from the table and kitchen.

The death-dealing microbes that lurk in the soil are like the mistakes of us Doctors, underground. Would that they "told no tales." When one of your friends dies, do not charge the cause to a Divine Providence, but inscribe upon his tomb, "Died of the mistakes of his fellowmen."

Cess-pools come in for a share of our attention. Of course, they will be condemned, for they deserve it. Why do you condemn a thing before it has a defense? Because it has begun in its work of pollution, and is still at it. Yes, its work of death. We truly are "Like unto whitened sepulchers, which are full of dead men's bones and all manner of uncleanliness." But, to be more explicit. They are being multiplied so fast that such a degree of saturation of the soil will soon be reached that our city will be, to say the least, unhealthy in consequence of the same.

Our only suggestion is, keep clean soil under us; cart off this refuse and waste, if not in sewers, then in scavenger wagons.

Excreta may be considered any dejections from the animal body. "The general high death-rate of 20 or 30 years ago, now happily so modified in many places, can be attributed to no other cause than the abominable pollution of earth, air and water.*

A great carelessness in the disposal of excrement is prevalent in our small villages and country districts. It is a fact that these sanitary subjects need to be understood as well by the people in the country as in the city, for they are as often violating these laws.

Three unsewered German cities, Leipsic, Dresden and Stuttgart have attained good results from a conservancy system. A comparison of seven German cities in which the utmost attention was paid to the disposal of night soil (five of them had sewers and two cemented vaults, often cleaned) with twenty smaller German cities which are either entirely un-sewered or but imperfectly supplied, is instructive. But, being beyond the limit of this paper, we refer you to the paper read by Erwin R. Smith, at Ypsilanti.*

* Erwin R. Smith, Proceedings of Sanitary Convention, at Ypsilanti, Mich., July 1, 1885.

Refuse in our cellars is a matter that needs our attention, especially during the spring. Have any of you opened your stable door of a morning, and felt the effect from the strong odor upon your eyes and nose? Do you doubt that the dumb animal should say, "Thanks for a breath of pure air, and possibly light too?" What is the matter there? Why, you have not done with your barn as you did with the privy, when it was foul and a public nuisance, namely: Moved it to a fresh spot and placed a few boards, and shovel fulls of sand over it; but have left the liquid manure to accumulate under the same, never cleaning or ventilating it. What shall we do with it? At least, put clean sand under your stable once, try the result, not forgetting to remove the saturated soil first; and do not forget to put a window in the barn.

The hole in the ground, called a privy vault, comes in for a full share of our attention, and it is left until the last that better justice could be done the subject, not the vault. To put it mildly, there never was a greater blunder made by civilized man than the usually constructed privy vault. Why, is it so bad, some one may say? It has answered for ages and nothing so very bad has apparently been the result. If the dead could talk to us today they would tell things that would make us hide our faces. They are so many "vials of wrath," against all laws of God and man, and always uncorked and bottom out too. Odors very unsavory come from the former and pollution of the soil from the latter.

It was said by Dr. Kellogg of Battle Creek that they have a custom out west of digging two holes in the ground after a house is built,—I presume one is to get the water out of, and the other to put it into. One partly supplies the other.

The object of sanitary legislation in England has been, of late, not to preserve their rivers for drinking water, but to prevent their becoming a nuisance in their character as open sewers. This comes as a result of the dense population, a thing that is becoming worse in our own cities. But, what are we to do with our vaults and cesspools? The former in un-sewered cities (and sewered as well) could be supplanted by the dry earth closet, which is simply a water-tight, shallow receptacle under a privy seat. It can be constructed with cement and should be daily treated with a liberal supply of what is becoming very common, coal ashes, or with clay properly dried. Then do not grumble when the scavenger comes, cleans the same and collects for the services too.

Allowing that privy vaults and cess-pools stand convicted of causing death and misery in our homes, what shall we put in their places? for we have thousands of the former and hundreds of the latter in daily use in our city. We cannot wait until sewers should be constructed, and even then many would not avail themselves of them. The dry earth closet for a vault, and a water-tight cess-pool, both frequently cleaned and cleansed, we would recommend. What does the hotel keeper say? "Do you think I am going to keep a man and wagon going the year round to cart off this stuff when I can get mother earth to do it for nothing?" She does not do it for nothing; but, like many over-burdened mothers do, will allow us to suffer as a result of too long continued burdens she is no longer able to bear.

Finally, all this is but talk, if not put in actual operation, at least in every newly-constructed building. Try it.

DISPOSAL OF WASTE AND EXCRETA IN HOLLAND.

DISCUSSION BY ARTHUR HAZLEWOOD, M. D., MEMBER OF THE STATE BOARD OF HEALTH, GRAND RAPIDS.

(Reporter's Abstract.)

In an early stage of human history the question was asked "Am I my brother's keeper?" and the great Teacher said: "Do unto others as you would that others shall do unto you." Do I do this when I buy a lot and dig on it a hole into which I deposit all the excreta of my family, the cow, the horse, and all the waste of my premises, when I know that my neighbor across the line gets his water supply near by, and that my excreta is contaminating his well? Am I doing right by this neighbor, or not? There should be some way to get rid of this excreta, and in such a way that it will not be a nuisance to any of our neighbors. We may say that the soil will do all this, and take care of it, but the soil will soon become so impregnated with impurities that it will fail to do its work. Some say that the chemical laboratory of nature will take hold of this waste material and purify it, but it is actually demonstrated and proved that for an area corresponding to the village lot, that the neighbor's well is only a drain for these excrements, and he must drink them in his daily water-supply. All this is entirely unnecessary and due to ignorance, and ignorance is the bane of society. Pullman is a city of 11,000 inhabitants, a city nearly in a swamp, and knowing all this its founders have made special preparations for the disposal of the waste and excreta, and have not permitted any of these abominations. Of course, where a place is small and is not possessed of much means, there cannot be as much done as there can be in wealthier or larger cities; and, as a result, we find that some of our larger cities have smaller death-rates than do rural districts. What do they all do with this great amount of excreta, and what will the people of Holland do? As early as possible, if you expect to grow, and you probably have the same aspirations as does any other city, let your city engineer devise some plan by which this is all alleviated, and let ordinances be made and the enforcement of them maintained. The sewer system seems to be the best method; but, if there is no sewer system, do not let your neighbors throw waste on premises where it will sooner or later get to your well. In England they are trying to prevent the pollution of the streams and water supplies, and have made very stringent laws to this effect, and you should profit by their teaching. When you adopt a sewer system adopt the separate system, and utilize your sewage, which you cannot well do with the combined system, in which the rain and surface water is mixed with the sewage proper. Pullman has a sewage farm which they use in the summer, and they have pipes by which they distribute the sewage to different parts of the farm. They have from nine to twelve acres of land, which they use for this purpose, and every day they use from one-third to one-fifth of the farm. This gives the rest of the farm a chance to rest while one part is used, and gives the air a chance to get into the soil and purify it.

To save yourself, your neighbor and every one around a great deal of trouble, before the city has a system of sewers, the best way to dispose of the excreta is by means of the dry earth closet, which is easily prepared

and with very small expense. You can collect your winter's supply of dust in the summer, and store it in barrels. Each time after the closet has been used there should be some dust or ashes thrown over the excrements, and this will render them inodorous; and, when the pail is full, it can be removed by the scavenger without offense to him or to the immediate neighborhood. Until the city can have sewers, I think that this is the best way to dispose of the excreta. The earth closet is spoken of in the book of Deuteronomy (xxiii., 12 and 13) where it says "Thou shalt have a place also without the camp, whither thou shalt go forth abroad: And thou shalt have a paddle upon thy weapon, and it shall be when thou shalt ease thyself abroad, thou shalt dig therewith, and shalt turn back and cover that which cometh from thee." Moses has shown him self able to get rid of the excreta. In the book of Leviticus it speaks of the destruction by fire.

There are some wastes which can be destroyed by fire, but this is not always handy. Some wastes can be burned in the kitchen stove, but this is a nuisance to the housewife. If it is not practicable to burn this refuse in the stove, a furnace for this purpose can be had without much expense, and which will destroy all the garbage. By this means of disposal you can keep your soil free from these impurities, and thus keep your wells from being contaminated. A garbage furnace is a good thing for a city of this size. Make yourselves custodians of the health of your neighbors as well as that of yourself, by keeping your own premises free from all impurities.

Rev. H. E. Dosker.—In assuming my present charge in this city, and after living here a short time, I found that my well water had a bad smell, and I had the well driven down through two layers of clay so that it is now fifty feet deep. I wish to ask the doctor if I am running a risk by using the water?

Dr. Hazlewood.—You are certainly running a risk, if your water is still contaminated, and the only way to be sure is to have chemical and bacteriological examinations made, and be sure that leachings from your neighbors' privies cannot reach your well, also that you are perfectly clean around your own premises. There is not as much danger from a driven well, as there is from some others, but driven wells do sometimes get contaminated.

Prof. Kollen, Hope College.—I wish to ask if nature does not help to get rid of the impurities of the water. I have read something to this effect. Along the Hudson river there are two cities in close proximity, Troy and Albany. Troy disposes of its sewage into the Hudson, and Albany gets its water supply from the same river, or a greater share of its supply. The water at Albany has been analyzed and found to be comparatively free from germs. I would like to be informed how long it takes water to percolate through soil; and if the water is not purified in some such way before it reaches Albany, for Albany is almost entirely free from typhoid fever.

Dr. Baker, Lansing.—Yes, the sewage of Troy goes into the Hudson river, and Albany gets its typhoid fever from the Hudson, and many people die there every year from that disease. I presume that the water has not been subjected to a bacteriological examination, but only to a chemical analysis which is not sufficient. A chemical analysis is not able to detect the presence of this poison, but the intestines of the human being are able to do so. The bacteriological and biological examinations are the

most important methods for determining whether water is free from the typhoid fever bacillus. But even these methods are not so certain as the method in constant use in Albany. You will probably have noticed that Dr. Vaughan was very careful in drawing his conclusions not to say that the water supply of Holland was pure and perfectly safe, for he did not have time to make the bacteriological examination, nor to inject the water into animals to see if the animal would have typhoid fever, or die.

Prof. Kollen.—I wish to ask if water running through pipes is purified, for there must be something of that kind in the supply for New York city.

Dr. Baker.—Typhoid fever is coming into New York, and they are becoming somewhat alarmed about the purity of their water supply. Chicago has had much trouble in getting safe water. An instance of how water will percolate through earth is shown by the noted outbreak at Lausanne, Switzerland. Some years ago in the village of Lausanne there was an outbreak of typhoid fever which caused over one hundred cases. Nearly all the inhabitants got their water supply from a mountain stream which came from a spring near by. This supply had been used for years, and without any typhoid fever, until this outbreak; but in this outbreak families in which this general water supply was not used did not have typhoid fever. Upon investigation, it was found that on the other side of the mountain there had been one or two cases of typhoid fever; and that near the house where the patient lived was a stream of water into which the dejections of the typhoid fever patients were thrown, and in which the clothes of the patients were washed. This stream sank into the earth and disappeared; the question arose whether it had any connection with the spring and stream on the other side of the mountain at Lausanne. By putting a few hundred weight of salt in the stream on the side of the mountain where the typhoid fever first occurred there was found a rapid increase of chlorine in the spring water on the other side, which showed conclusively that this stream percolated through the mountain and came out on the other side, as the spring which supplied the village of Lausanne with water. Several hundred weight of flour was then put in the stream, and they tested for starch on the lower side, and could not find any, the soil filtered the flour out of the water. This all showed that the water was filtered through the earth, and did not pass by an underground channel. This water had been used for years without any serious results, but as soon as the typhoid fever germ got into the water there was this epidemic of fever. It shows that the specific cause of typhoid fever in water may filter through the soil for a long distance.

Dr. Yates.—Now New York gets its water from a water-shed which covers a vast area of land, and they claim such a low death-rate; I want to ask if the death-rate is not higher than the birth-rate?

Dr. Baker, Lansing—I am under the impression that it is not. I do not think its birth-rate is very accurately learned. The water supply of New York has been somewhat guarded, and comparatively good.

There is this difference between a general and a private water supply: It is important that the well should not become polluted, but it is vastly more important that a general water-supply should not be contaminated for that would be very much more dangerous than if the private supply should be contaminated; for in the one instance there might be a great many cases and in the other instance only one or two isolated cases; in

the one instance there would probably be an epidemic, and in the other only a local outbreak in a family or neighborhood.

Charles Scott, President of Hope College—I wish to speak of an epidemic which seemed to have no cause, but after some investigation of the matter, it was found that the epidemic was in a locality whose milk supply came from a certain dairy farm. It was found upon examination that, by some means, the typhoid fever germ had gotten into the milk, and they found that it was probably due to the milk cans being washed with water from a well which was contaminated by the dejections from a typhoid fever patient who had lived on the farm. The use of this water for washing the cans was prohibited, and the well was locked, and the result was that the typhoid fever abated, in that locality furnished with milk from this farm, and finally died out. There has not been a case of fever in that locality since.

It is not just the time when the subject of sewerage should be discussed, but, for fear that I may not be here when the paper is read, I should like to say what I have to say this afternoon.

There are several things which should be considered in connection with the sewerage question. There are certain conditions which should exist prior to the adoption of a sewerage system. 1. We should have an efficient health officer, an efficient board of health, and efficient sanitary inspectors, with laws and ordinances which would give them absolute power. Some of these officers we have, and some of them we do not have, but we have not the laws and the ordinances upon which to base their actions. There should be no sentiment in the performance of their duties. We should have officers who would not work with the public sentiment but would act according to the dictates of the laws. 2. When we get a sewer system, everyone should be obliged to use it. 3. Are we satisfied with our present water supply? We should have a pure water supply, and should have an expert frequently examine the water to see that it does not get contaminated. 4. The sewers come last, and we should consider these three things first. After we get the sewer we should force everyone to make connections. We should start with one good sewer first, and not get too deeply in debt on the start, but just as soon as the first one is paid for, put in another, and so on until we get a complete sewerage system; and until the town can thoroughly dispose of its sewage. Market street is the street first to be sewered. We need these sewers, and the city should pay for them, for it is for the direct benefit of the city.

Dr. Yates.—We have had a severe drubbing about our sanitary condition, and if things are in such a bad condition, the fault lies somewhere. Now who are the guilty parties? I know that we are deficient in our sanitary conditions. We have been told by our city attorney that our laws are not sufficient, but why do we not have laws which will be sufficient and have them enforced? We have a good health officer, and he has been very active in getting the board of health together and taking measures to stamp out the recent epidemic which has had such a mortality in our city. The city laws are lacking. There should be an ordinance which would prohibit any one from building a privy without cementing the vault; there should be a scavenger who should be obliged to give bonds for the fulfillment of the duties of his office. Such ordinances have been presented to our city council and have been laid on the table. What does all this mean? It means that there has been no interest taken in the passage of these ordinances, and that no influence has been used on the aldermen to pass

these proposed ordinances. Who can get up and say that he has himself personally worked for the passage of such laws? Who holds these responsibilities upon himself? I am sorry that there are not more of the worthy gentlemen here this afternoon to hear what has been said about them; but, those who are here, have influence and I hope that in the future they will use their influence in the right direction. These ordinances will never pass the council unless there is some personal work done on the aldermen. If we are to have a sewer system in the city of Holland we have got to do some hard work to get it. We must have strong, sanitary laws passed and have them enforced. We have too many to work against the board of health and the health officer, and hold them up—just as the highway robbers hold up travelers in the west, and demand their money —they demand that they keep in the back ground.

Hon. G. J. Diekema—It is a very fine thing to fix all these things here, but it is quite another thing to bring them into practice. It is all very different when we try to convince men against their own wills that such things should be done. We are dealing with men who have their own wills and have their own ways of thinking. The only final measure is to arouse the public sentiment and feeling in this direction, and instruct the people, and get them in sympathy with the passage of these sanitary ordinances. If the health officer was to go around and pry into other people's affairs, at the next election he would be ousted, and a man who would mind his own business would be put in his place, and would probably have an increase in salary. We have noticed that an epidemic is a great public educator, for there has never been such a cleaning out in Holland as there was right after the diphtheria had abated. Then was it that the word of the health officer was obeyed. Then was it that the recommendations of the local board of health were complied with. We have just as good a health officer as there can possibly be, but he cannot successfully work against the public sentiment. What we need is the education of the people generally, then the word of the health officer will be obeyed and his instructions followed; and this is the practical remedy and the only remedy.

On motion of Dr. Yates it was voted to postpone Mr. Van Schelven's paper on the subject "Should Holland have a Sewerage?" until the first thing in the evening session.

On motion of Mr. Beech the convention adjourned until the evening session.

Vice-president Godfrey, of Hudsonville, presided during the afternoon session.

FOURTH SESSION, FRIDAY, MARCH 4, AT 7:30.

The convention was called to order by the president, and Prof. G. J. Kollen was called to the chair.

Dr. Yates—For something like a year past, certain citizens of this city have been talking, in offices and about the street corners, of the economic way by which to dispose of the waste and excreta, and this is the evening when this subject of great importance is to be discussed, and they have made themselves most conspicuous by their absence from here this evening. I wish, however, to thank the ones who have assembled here this evening, and the musicians for their kind and enjoyable contributions to the success of this convention.

Mr. G. Van Schelven gave the following written address.

SHOULD HOLLAND HAVE SEWERAGE?

BY G. VAN SCHELVEN, HOLLAND.

The discussion of this topic before our public may be considered as peculiarly timely.

To the question itself, whether Holland should have sewerage, taken from a purely sanitary standpoint, there can be but one answer—an unequivocal yes, and whatever may lead towards an agitation among our citizens, tending to the ultimate introduction, at an early date, of a general sewerage system, is duly in order. To the extent therefore that this convention may be promotive thereof, we hail its advent in our midst with delight.

Among the many municipal problems in our day none is considered of greater importance than that of local public health, and for its successful maintenance the prompt removal from the immediate vicinity of our homes of all offensive household waste and excrement, is a pre-requisite.

It is true, that a large portion of this waste can be instantaneously removed by burning in the stove; and, by the way, this simple and efficient method can and should be more generally followed. But, what cannot be thus removed, or otherwise carted away, appears in our day to be relegated to the water carriage or sewerage system.

A glance at the program mapped out for the convention suggested to me, while preparing this paper, the impropriety that I should dwell at any length upon the absolute sanitary feature of my subject, or attempt to urge it upon those grounds. We have listened today to an able paper, followed by an instructive discussion, on the "Disposal of Excreta and Waste," and it will be my attempt to follow this up by treating the topic assigned to me from a purely local standpoint, limiting myself to the problem of sewerage proper, as it presents itself to the *resident* and *taxpayer* of Holland.

It is but natural that Holland, located as it is, should sewer into Black river or Black lake. If in the river, it will have to be below the water works, so as not to further contaminate whatever water is unavoidably taken from the river, in an exigency of fire. Just *where* to locate the exit, is a matter of importance and has already been the subject of a limited discussion in the local press. However, it seems to me we should go out some distance down the lake, into deep water. By allowing any of the sewage to flow into the river, there is great danger that a portion of it will gradually find its way back in the basin, at the head of Black Lake, and we all know that that part of our public waters is already sorely polluted by all sorts of putrifying matter.

Of the two systems of sewerage in vogue, the *combined* and the *separate*, I think the latter—which is limited to the small sized sewer for the removal of sewage proper only—is the most suitable for a city, the size of ours, the combined system being too complicated and too costly, and also apt to be too heavy a drain upon the water supply. Besides, the combined system,—which carries off both sewage and storm or surface water—makes it necessary to accommodate the sewer to the heaviest rainfall, so that in dry times the sewage flowing through so large a sewer, causes it to flow very slowly.

From a preliminary survey made last summer it appears that we have an average fall throughout the city of 28 to 30 feet to Black river and lake, ample for sewerage purposes. We gather this limited information from a report made the other week by a special committee of seven of our eminent citizens, appointed by the mayor to investigate the question of sewerage for this city. We had flattered ourselves all along that their inquiry and deliberations would have imparted some valuable information, bearing upon the topic of this paper. It seems however, judging from the tenor of their report, that the committee lacked sufficient faith in the final outcome of their own effort, to give the matter that thorough research which is essential to create favorable public sentiment and carry conviction; which fear was subsequently realized, when the common council indefinitely tabled their report, wherein they recommended an appropriation sufficient to engage expert exgineering services for the planning of a general sewerage system. This report still lies *on* the table, unless by this time it has got *under* the table.

In anticipation of a possible disappointment with the tenor of this paper, as far as our distinguished visitors of the State Board of Health are concerned, it is proper for me to state right here that a large element of our population—I might say three-fifths—are not ready for the immediate introduction of a general sewerage system. This can be attributed to several causes, first among which is a want of insight into its important bearings upon the public health. Upon this feature however, as stated before, I leave the field to those who can speak with the authority of experts—the medical profession.

A proper diffusion of information and a reasonable agitation of this municipal need, I am satisfied, will in due time largely remedy this. Personally I entertain no doubt but what the citizens of Holland, will ere long, look upon this matter as they did upon their harbor improvement; their street grading and graveling; their fire protection and water supply. It will come; and the convention whom it is my pleasure and privilege to address will no doubt be a leading factor in bringing about such timely result.

Another drawback at present—and I do not know but what it is the most serious, and as such a plausible one—is the matter of cost and *taxation.*

The territory within the present city limits contains only a trifle over one section of land. Within these limits the population is between 4,000 and 5,000; the assessed valuation $900,000; the bonded indebtedness, both city and school, fully $70,000, or nearly 8 per cent; with a tax rate this winter of 3 and 6-10. Now, while I do not wish to set up human life and the blessing of health against mere dollars and cents, I submit however, whether in view of the above, and with our present limited territory, we should add another dollar to our bonded indebtedness, unless it be in a matter of the greatest exigency. And I further maintain, that under no circumstances whatever ought our taxes to be increased, beyond this excessive rate.

I might further add—in parenthesis, as it were—that besides this sewerage problem other municipal improvements, involving extraordinary expenditures, are or will be on the tapis, crowding more or less for early recognition, such as *an additional school building*, somewhere in the city; *a greater water supply*, a matter which may become urgent at most any day; the organization of *a third fire company* in the western part of the city,

and its equipment and engine house,—not to speak of minor important projects, such as an electric light plant to be owned and operated by the city.

My only object in mentioning these matters, on this occasion, is to rightly understand the municipal situation with reference to the question of sewerage and taxation, as we at home know it to exist.

Another feature which has added to the existing indifference in this matter, and which should not be overlooked, is that the class of buildings in this city which stands directly in need of sewerage connection has until now been proportionately small. It is only recently that we have seen a number of commercial blocks and dwelling houses go up, for which it can be claimed that the expense of sewer connection is in anywise commensurate with the cost of their erection. Several of these buildings however have had private sewers constructed, as a matter of dire necessity, and more are to follow, going to show that sooner or later—perhaps at an earlier date than we now even anticipate—Holland *must* face the project of general sewerage, or see its growth and prestige retarded by the non-construction of a better and more substantial class of buildings.

But in order to meet to some degree the object of the occasion that brings us here, I desire to submit a few suggestions bearing upon the prospective sewerage of Holland:

The division of the city into main sewer districts, as a fundamental feature of a permanent system, can hardly be thoroughly and satisfactorily undertaken before the extension of our municipal boundaries. This however need not necessarily be delayed beyond the next session of the Legislature.

The cost of constructing the *main* sewers, with their branches if required, should be made general, and be spread over the entire city—for *city* or *district* assessment for main sewers is *the same in the end*:—while the cost of *lateral* sewers in the sub-districts should be made special and assessed to the premises to be benefited, and be made payable in yearly installments, same as our special assessment for street improvement.

In order to obviate the creating of numerous boards in a small municipality like ours, and still secure *system in the construction* and *thoroughness in the supervision* of sewers, this branch of the service should be joined with that of our water supply, and made to constitute one department, under one board, with a clerk of their own selection, the common council always retaining jurisdiction, the same as it now has over the board of water commissioners.

When we are finally ready to begin laying sewers too great a distance should not be attempted at first. Our experience in street grading and graveling is that each succeeding street is being improved at a lesser cost than preceding ones.

I find that the approximate cost of a lateral sewer, 9 to 12 inches tile, including digging, tile laying, manholes, catch basins, etc., is from 60 to 90 cents a foot; that of a 20 inch sewer is from $1.50 to $1.75 a foot. Sewer pipe leading from the house or yard into the street need only be 4 or 6 inches. The cost of making the connection, to the individual, in this city, will average about $30.

In conclusion.

A small city may for a time get along without any special system for the disposal of its household waste: but as it becomes older, and more and more thickly populated, and its soil saturated with putrified matter, its

future sanitary condition demands a new and more efficient mode for its removal.

It is only a question of a very short time, when, at the present rate of our growth and development, Holland must tackle the building of sewers. Now let us as individuals and as a municipality give the matter that due attention which will insure a common and lasting approbation of the results so established. The trouble with many a corporation when it entered upon sewerage has been, that it failed to get a good ready, the inevitable outcome of which was that the expenditures incurred did not secure them *permanent* results.

Dr. Kremers.—I am very much pleased with the points which have been touched upon by the gentleman who has just given us the able paper on the sewerage of this city. In the near future he says that we must attack the sewerage question. I should like to add that the time is right here, and that I for one should be very glad to have it right away, for I know that property would raise in value immediately, and I am sure that my property would be worth at least $500 more. I don't remember just what it cost to clean the school closets, but I know that whatever it has cost, which is no small amount, would be saved, and would help to pay for putting in a system of sewers. A system of sewers would benefit the people of Holland generally. We have a splendid chance to dispose of the sewage, for this city is so much higher than the lake.

Mr. VanSchelven.—I found in taking the census last spring that I could trace the principal mortality, and that it was in certain districts which were not noted for their cleanliness to any great extent. I think that a sewer system would do away with a great deal of this heavy mortality.

Dr. Baker.—I think that it is a continual money loss to the citizens of Holland just as long as they neglect to adopt a system of sewers. You can see by the diagram on the wall there*, that the decrease in the death-rate from typhoid fever in Munich, upon the adoption of sewers, was very great, and there would be a corresponding decrease in the city of Holland if such measures were taken.

Dr. Yates.—I wish to ask the same question that Dr. Hazlewood asked: —What will we do with the sewage? Will you dump it on the marsh, or will you dump it into the lake? Then there is the expense, and we are to have so much expense in the coming year, we shall have to be very careful if we don't get into debt so far that we will never be able to get out. There is the question of a new school house, an electric plant for lighting the city, and the question of where this tax will be levied; whether it will be levied as a whole or individually? I apprehend that cemented vaults will be the outcome of our sewerage. Whose fault is it that we have not had all these sanitary ordinances? It is not the health officer, for he is an earnest worker, and earns every cent of his salary; he is however too modest to speak of his magnificent salary. It is the fault of the aldermen. We are soon to have an election, and then is the time when those interested in having some sanitary ordinances in this city should see that the right men are elected, who will pass laws if they are presented, and will not lay them on the table indefinitely.

Music was here furnished by the Holland Double Quartette—Mrs. G. J. Diekema, Mrs. J. H. Gillespie, Mrs. A. VanRaalte, Miss Trude Alcott, Messrs. P. Soulen, H. Broek. and Prof. J. B. Nykerk, with Miss Boone as accompanist.

* This diagram, "Typhoid Fever and Sewers," is printed on page 66.

SCHOOL SANITATION.

BY P. H. MC BRIDE, HOLLAND.

(Reporter's Abstract.)

As the gentleman who is to follow me has so much better an idea of the subject than I have, I will say what little I have to say and then let him say the rest. I would like to call your attention to the method by which our main school buildings are heated and ventilated. It is what is known as the Smith and Hyatt system of heating and ventilating. The fresh air is blown in over a coil of steam pipes by means of a blower which is run by steam, and is thence carried over the buildings. By means of a large pipe running under ground to the other building, the steam is carried about seventy-five feet. I think that the system is giving good satisfaction, and that it furnishes fresh air and plenty of it. By forcing this fresh air into a room a pressure is created which is supposed to force the foul air out. What I wish to ask is, whether the foul air will be forced out by this pressure or whether it will fall to the floor and remain there?

SCHOOL SANITATION.

DISCUSSION LED BY PROF. DELOS FALL, M. S., MEMBER OF THE STATE BOARD OF HEALTH, ALBION.

(Reporter's abstract.)

I dislike very much to enter upon any discussion unless I can find some reason for the justification of the act. I fail, however, to find any justification for my leaving home and neglecting my personal duties to come here and do what it seems to me some one else should have done. This program has been arranged by good men and I do not wish to find any fault with those who had to do with the arrangement of the program or with those who have participated in this convention, but I cannot see why this paper on school sanitation should not have been given.

The coming generation will be composed of the young people of today and they will have had more advantages for education and general improvement than have the present generation. They will be better educated, and should be educated on this subject, and should have the best hygienic conditions surrounding them in their places of education and in their homes. The middle class of men and women at present, and the class in which we might class ourselves, are not generally well educated. But we must see that our children and our children's children have sanitary surroundings and hygienic conditions which are most conducive to the best health and work. They should have the constitutions which would be conducive to the best work.

As I view this subject, there are three parties which should have our consideration; namely, the children, the board of education, and the patrons of the schools.

The children are not responsible for their sanitary surroundings and are like the politician who is always in the hands of his friends and never

in his own hands. Mr. McBride has addressed the second class, the members of the board of education. I am glad to hear that this city has nine school buildings and that none of them are over two stories high.

We should have plenty of air-space in a room which is occupied by human beings. Sanitarians think that 800 cubic feet is about the right amount for an individual, and that the very minimum amount is 300, providing that the air is constantly changed. In a town not a thousand miles from Holland the rooms are so small that each pupil has only 190 cubic feet of air-space.

When there is more than the normal amount of carbonic acid gas in the atmosphere which we take into our lungs, and the gas is derived from the respiration of human beings, the result of inhaling such an atmosphere will be headaches and other bad effects. In the room 28 by 20 by 12, where there are fifty-six children, the proportion is very much below the minimum amount permissible for the best results of work.

Replying to the question by Mr. McBride, I very much doubt that the plenum system (forcing air into the rooms) is the most effective system of heating and ventilating. In the out-going air you have a diffusion of the pure with the impure air, and some of the bad will be left in the room. It seems to me that the method of withdrawing the foul air by heating the foul-air shaft, and taking the foul air from the room at the floor level, is the best and most effectual method of getting rid of the impurities. The foul air should be taken from the floor level, and not two or three inches above the floor, for that would probably leave a lake of cold air which would keep the feet of the pupils cold. There are many things which I might say on this subject, but I will not take the time which might be used by others.

Prof. Higgins, Supt. of Schools, Holland.—I was very much pleased to have Prof. Fall bring up the subject of the size of the rooms, and the amount of air space which each pupil should have, and the number which should be in attendance in each room, to be most beneficial to the health and welfare of those concerned. I have thought of this same thing a great many times, and I have anticipated this opportunity for gaining some information on the subject. There are some features about this which should receive our attention. I give an account of rooms under my observation:—

1. Sixty-eight children, cubic contents of the room 11,640. According to the best authority we should have not less than two hundred feet, and this room has less than 171 to each person.
2. Fifty-six pupils, cubic contents of the room 11,000.
3. Sixty-two pupils, cubic contents of the room 13,580, which is 219 cubic feet to each individual. The room is 31x30x14 feet.

Now the question is, is this conducive to the best health of the pupils, teacher, and all concerned, whatever the ventilation used? The children are from all parts of the city, and from all kinds of sanitary conditions. Some of them have dirty faces, and it may be that their bodies are not in the best and most cleanly condition, nor their clothing.

There are many authorities who recommend the single desk, and I wish to ask the opinion of some of the learned gentlemen here this evening what they think. Is it conducive to good health, and can the pupils do just as good work, where they are in double seats, as they would in single ones?

I have had some experience with the present system of heating and ventilating in our schools, and think that it is giving good satisfaction; at

any rate I know that we are having better service than we had last year. I have experimented with this system some, and the only trouble that I have is to keep the rooms at the right temperature. I have tried many different experiments to see if I could not alleviate this trouble, and have tried one today which seems to help matters. I shut the fresh air off from going directly over the steam coils so that it will go around them instead, and found that I could keep the room down to about the right temperature without so much trouble, and as far as I can see the ventilation is perfect.

Dr. Baker, Lansing.—In answer to Prof. Higgins' question—Whether it would not be better to have single desks?—I think there should be only one pupil in each desk, for many reasons which I have not the time to enumerate this evening. There should certainly be a less number of pupils to the amount of air-space mentioned by Prof. Higgins.

A violin solo by Mr. William Breenan, accompanied with the piano by Miss Reka Boone.

THE DUTIES AND COMPENSATION OF THE LOCAL HEALTH OFFICER.

HOW MUCH OUGHT THE CITY OF HOLLAND TO PAY ITS HEALTH OFFCER?

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICHIGAN.

I presume that the reason why each city is required by law to have a health officer, is that sentiments of common humanity dictate that proper effort shall be made, constantly, by the officers of every locality, for the best possible protection of human life and health within their jurisdiction.

But in this paper I propose to go a step further, and to point out the fact that this high humanitarian position which the law contemplates, when it requires cities to guard the health of their inhabitants, and to contribute facts and statistics for the general welfare of the people of the state, that all this, from a financial stand-point, pays the people of each city. I propose to speak especially of the city of Holland, but the same principal which applies to Holland, is applicable to other cities.

Let us estimate the population of Holland as about four thousand, and that the death-rate is about the same as it has been in other parts of Michigan where it was not specially influenced, say about seventeen per thousand inhabitants per year. Then, the average number of deaths in Holland per year would be about sixty-eight. Of this number, a little less than twelve per cent would be from consumption, six and one-half per cent from diphtheria, two and seven-tenths per cent from scarlet fever, and three and two-tenths from typhoid fever. These are all communicable diseases, and they are preventable through measures which are now known to health authorities.

Reliable statistics, collected by the Michigan State Board of Health, have proved that (even after the disease is introduced) about seventy-five or eighty per cent of the deaths which otherwise would occur from diphtheria and from scarlet fever are prevented if complete isolation of all infected persons is enforced, and there is then thorough disinfection of all infected substances.

I believe that there is a similar saving of lives from loss by typhoid fever, where the proper local health measures are enforced. Relative to typhoid fever, these measures are not so completely dependent upon

efficient services by a health officer as are those relative to diphtheria and scarlet fever, yet they will not be likely to be effective except such services are maintained.

It is possible, then, through and in connection with the services of an efficient health officer, to save, in a city the size of Holland, in each year, the lives of about three persons from death by diphtheria, about one person from death by scarlet fever, and, I think, about one person from death by typhoid fever. In some years they might be more, and in some years, less; but these are the average figures per year, for a series of years. Surely the saving of these lives, and of the sickness of the still larger number of persons, is well worthy the effort of the city in compliance with State laws. But I wish to point out the fact that in saving those lives, and in the lessening of sickness, there is saved to the city that which has cost money, and that which if lost, would have been a loss in money values far in excess of the cost of any effort which the city puts forth in sustaining an efficient health service. It costs money to raise up children to the age when they become producers of wealth. If children are permitted to die of communicable and preventable diseases, there is a great waste not only in life, health and happiness, but also in money, Statisticians have computed the average value of an adult person, for what that person will earn in excess of cost of maintenance, as about one thousand dollars. Practically about the same conclusion was reached by those, in the south, who some years ago bought and sold slaves, a good one selling for about eight hundred dollars.

If, now, we consider that the four children or persons in Holland in each average year, whose lives should be saved from diphtheria and scarlet fever, are each worth five hundred dollars, there is in each year a saving of two thousand dollars from those two diseases alone. If one life is saved from typhoid fever, by disinfection of infected matters, and by other methods which a good health officer could teach, the person saved from that disease would ordinarily be in the prime of life, and this saving should be counted as one thousand dollars.

There is, then, a probable saving of three thousand dollars a year in Holland, by such work as can be and should be done by and in connection with the services of an efficient health officer, and this with reference to only three of the dangerous communicable diseases. Of course, I believe that lives can be saved from other diseases than those in which I have just computed the saving, but I have omitted them because not needed in my argument, and I have selected the three which I mentioned, because in diphtheria and scarlet fever we have the absolute proof that lives can be saved by measures that are well known to us, and in typhoid fever it has been proved beyond question that the disease can be almost entirely prevented by other measures which are equally well known.

In this brief statement of facts I have omitted all consideration of the costs incident to sickness, including physicians' compensation, medicines, nurses, loss of time, etc., also the cost for funerals, and have confined myself rigidly to the money losses through the actual deaths from three diseases. Without the efforts which I have supposed to be put forth by an efficient local health service, there is a money loss in a city the size of Holland, through the actual deaths from those three diseases, equal to three thousand dollars per year. Is it not better and really more economical to pay three thousand dollars per year for public health service than to bury that which is equal to that amount in money value, in the graveyard?

I am ready to admit that this counting of the cost of the life blood of your neighbor and perhaps of yourself; of your neighbor's child, perhaps of your own child, is to me exceedingly repugnant; but so long as your neighbor's life and your own, the lives of your neighbor's children and of your own are not properly guarded, but are permitted to be endangered from these same diseases that I have mentioned, it is plain that some other argument than the usual one, must be presented.

Undoubtedly public-health work in cities is neglected because of lack of information as to *how much* effort should properly be expended. Such computations as those I have put before you, should help us to arrive at conclusions on this point.

There is another way in which we can form an opinion on the amount of money which may properly be used for the public health service of a city: Let us suppose that some awful calamity which could have been prevented but was not, was to destroy all the people in this city. We will at once appreciate the fact that that would be of vastly more consequence than such a calamity as the destruction of all the property in the city by fire; because, even without the assistance which would come from without the city, the people could soon earn more than enough to sustain life tolerably. We do not usually act in accordance with this fact; but whoever will take the trouble to examine the subject, will see that it is plain that the safety of the lives and health of the citizens of this city are of greater importance than the safety of their property from destruction by fire. Therefore, it is proper that the public-health service of this city should be better supported than the fire department is. I do not know what your fire department costs; but in many cities the total expenses for this purpose equal nearly a dollar per inhabitant per year. If there are four thousand inhabitants in Holland, its fire department, and the expenses incident to the protection from fire, may quite properly cost nearly four thousand dollars per year. But if they cost one thousand dollars, they cost more than the city expends for its public-health service, and, as I have suggested, the safety of the lives and health of the people in Holland are worthy of greater effort than is the safety of the property at risk from fire. From this standpoint, therefore, the city of Holland might well afford to pay much more than it now does for the proper protection of the lives and health of its people.

We will admit, if you please, that when deaths occur, the loss is not equally distributed among the people of the city; generally the loss falls most heavily upon the berieved family, and this is especially true if the death is of the bread-winner of the family. But it should not require much argument to show that the prosperity of a city depends greatly upon its healthfulness and the safety of life therein, and that, in a long series of years, the deaths are distributed somewhat equally among the people, and that, even if they are not equally distributed, a high moral sentiment should prompt us to guard the common safety of life among us. It was recognized even before the Declaration of Independance, that to each citizen the right to exist, the life of the individual is among the inalienable rights to secure which "governments are instituted among men." It is plain, therefore, that one of the highest, perhaps the very highest function of government is to guard the lives of the people.

Having reference, then, to only three important diseases, it seems plain that a city the seize of Holland has the undoubted right to expend in every year at least $3,000 for the restriction and prevention of diphtheria, scarlet fever and typhoid fever. I think that there is good reason to

believe that the citizens of Holland would make money by this work; because there is good evidence that by expending three thousand dollars per year there could be saved three thousand dollars worth of lives from three diseases alone, and they would incidentally save lives and cases of sickness from other diseases than those I have mentioned; and, besides, in my account of the losses by those three diseases, I accounted only for the losses by reason of the deaths, leaving out of the account all the great expenses for the sickness. For instance, from the two diseases, diphtheria and scarlet fever alone, an efficient health service, properly supported, should in each year save all the expenses incident to 36 cases of dangerous sickness.* All such saving would be a clear profit, in case the city expend the $3,000 yer year, as previously suggested, and save $3,000 worth of lives, as I have shown may reasonably be expected.

Of the $3,000 per year, which I have computed could be saved in lives with that amount. I would advise that at least $1,000 per year should be expended directly and indirectly toward securing a water-supply which is above suspicion. This with special reference to the prevention of typhoid fever. I would use some portian of the $1,000 per year toward securing good sewerage, and a proper disposal of waste. This, also, with special reference to the prevention of typhoid fever, by improving the water and otherwise.

This city could well afford to pay $2,000 per year salary to its health officer. But if it paid him fifteen hundred dollars per year, there would then be five hundred dollars left, for expenditures under the direction of the health department; and in that case, I would advise that it be used in sanitary improvements relating to Schools, with special reference to ventilation and the dangerous communicable diseases.

The law now requires much more of the health officer than it formerly did; and it provides fines and imprisonment for neglect of duties connected with dangerous diseases. If the health officer attends to such diseases he must lose his ordinary practice. Accordingly his compensation should be greater than formerly; it should be greater than he could obtain for the same time by the regular practice of his profession as a physician,—the life and health interests of the whole people of a city are of more consequence than those of the patrons of any single physician, no matter how large and lucrative his practice may be. But there is another still more important consideration. No reputable physician claims to *cure* any real specific disease such as diphtheria, scarlet fever, or typhoid fever. After a person has contracted the disease, it is important to have a skillful physician to watch and guard the patient as thoroughly as possible through the course of the disease; but no physician claims to break up or stop the course of the disease. Physicians are needed to lessen the chances of death among those who have been permitted to contract these preventable diseases. The truest economy consists in lessening the chances of contracting such diseases, the compensation to physicians, therefore, should be for the prevention of all such diseases, then it would not be required for the cure, during which a large per cent of the cases prove fatal, and this under the best methods of cure in the hands of the most skillful physicians. About the only practicable method of transferring the compensation to the proper kind of service is to employ the physicians as health officers and as members of local boards of health.

* The reports, compiled by the Michigan State Board of Health, show that for each death from scarlet fever there are over ten cases of sickness from that disease; that for each death from diphtheria there are four cases of sickness from diphtheria.

In many places the people are so ignorant on these subjects that they do not provide sufficient compensation to induce the best physician in the city to act as health officer, and to give his whole time to the public service. It is noticeable that it is in just those cities which do not sustain an efficient board of health, and do not constantly employ and pay for the services of a first-class health officer, that the dangerous diseases are so destructive. I am informed that here in Holland the health officer receives from the city only $50.00 per year.* That fifty dollars is for guarding the interests of the health and life of all the 4,000 people in the city. At the same time there are in Holland six physicians who are paid and well supported, each attending to the sick among only a portion of the people of this city.

I do not question but that, thus far, you have had the services of your best physicians as health officers, but I fear that the saving of life and treasure which I have computed as possible has not all been made in Holland; and I do not believe the greatest saving of life and treasure will occur continuously until you pay the prices required; but I look forward to a time when, through the payment of a few thousand dollars per year for a complete and efficient health service, there will be saved the lives of even more than the eight persons whom I have computed should be saved from diphtheria, scarlet fever, and typhoid fever, and to a time when Holland shall have become one of the favorite health resorts of those who every summer seek to avoid the heated atmosphere of localities further south, or more distant from the lake shore.

Mr. VanSchelven.—I think that the doctor has been very lenient in giving the death rate of Holland, for, in reality, it is about double that which he gave.

Dr. Mabbs.—I doubt very much that Holland will ever pay such a salary as mentioned by Dr. Baker, and I fear that Dr. Baker is something like the old woman who made a prayer; and, when being asked if she ever expected to get any answer, she said, that she never expected to receive an answer when she made it.

MISCELLANEOUS BUSINESS.

Dr. Baker, Lansing.—In behalf of the State Board of Health, I rise to express our thanks for the attendance at the different sessions of this convention, and to the ones who have taken such active parts in the discussions; also, for the kind entertainment we have received while in your city.

On motion of Dr. Kremers it was voted that the convention extend thanks to the members of the State Board of Health, and especially to Dr. Baker, for their kindness in coming to teach the people.

On motion of Mr. Diekema it was voted that the convention extend a vote of thanks to the members of the church in which the convention was held, for their kindness in granting the use of it.

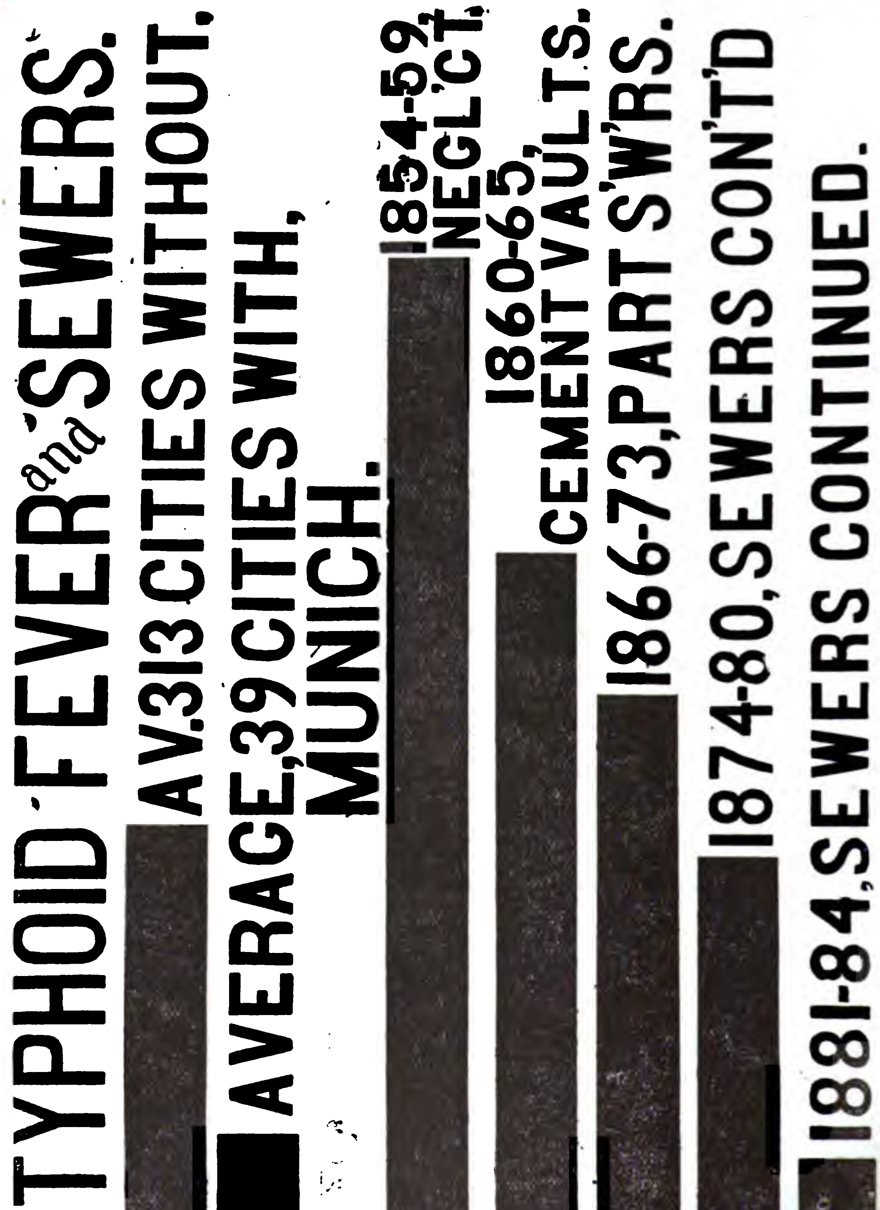
Dr. Baker moved that there be a vote of thanks to the officers of this convention for their zealous work in making this convention a success,—which motion prevailed.

Dr. Mabbs moved that the publication committee take charge of Mr. McBride's paper on School Sanitation,—which motion prevailed.

On motion the convention adjourned at 9:45 P. M.

* He is paid one hundred dollars for his services in treating the sick poor.

Typhoid Fever, Sewers and Water-Supplies.—In the diagram below, the first line represents the deaths from typhoid fever in 318 cities *without* sewers. The next line shows the deaths from typhoid fever in 39 cities *with* efficient sewerage. The reduction in typhoid fever after sewerage is great; but it is not all due to sewers; it is due greatly to the comparative purity of the general water-supply, introduced when the sewers are, and partly to the lessened impurity of the water in the wells used after sewers are constructed. In the lower half of the diagram, the upper line represents the death-rate from typhoid fever in Munich, Bavaria, when the inhabitants drank water from wells, and the excreta were stored in ordinary privy-vaults; the death-rate was then 24.2 per 10,000 inhabitants. In 1860 the city required the cementing of the vaults; the second line shows the reduction in the fever. In 1866-73 the city commenced a system of sewers; the third line shows another reduction. In 1874-80 the sewers were continued; the fourth line shows that the reduction continued. In 1881-84 the sewers were further continued; and the lower line shows the deaths greatly reduced. In 1884 the deaths from the fever were reduced to 1.4 per 10,000 inhabitants. That is, when the people of Munich drank water from wells which drained the privy-vaults, the death-rate from typhoid fever was about seventeen times as great as it was after the city was well sewered and had a good general water-supply.

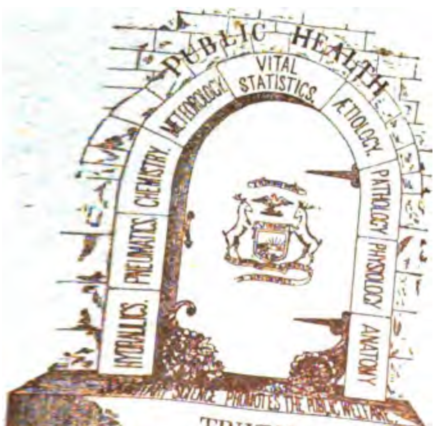


PROCEEDINGS AND ADDRESSES AT A SANITARY CONVENTION HELD AT STANTON, MICHIGAN, APRIL 27 AND 28, 1893.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF STANTON.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1893.]

[No. 373.]



MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY

LANSING
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS
1893

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

STANTON, APRIL 27 AND 28, 1893.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH,
FOR THE YEAR 1893.

[No. 373.]

Robert Smith & Co., State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

STANTON SANITARY CONVENTION.

CONTENTS.

CONSUMPTION IS A DISEASE DANGEROUS TO THE PUBLIC HEALTH.

ESOLUTION ADOPTED BY THE MICHIGAN STATE BOARD OF HEALTH SEPTEMBER 30, 1893.

"*Resolved*, That hereafter, consumption (and other diseases due to the *Bacillus tuberculosis*) shall be included in the official list of 'Diseases dangerous to the public health,' referred to in sections 1675 and 1676 Howell's statutes, requiring notice by householders and physicians to the local health officer, as soon as such a disease is recognized."

[In this resolution the question of isolation of the patient is not mentioned. Its purpose is to secure to the local health authorities and to the State Board of Health information of the location of each case of this most dangerous disease, with the view of placing in the hands of the patient reliable information how to avoid giving the disease to others, and in the hands of those most endangered information how to avoid contracting this disease. HENRY B. BAKER, *Secretary*.]

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Stanton, acting with a committee of the State Board of Health.

The following persons constituted the various committees:—

Committee from the State Board of Health.—Henry B. Baker, M. D., Lansing, and Prof. Delos Fall, M. S., Albion.

Local Committee.—Dr. N. E. Bachman, Chairman; Dr. W. P. Gamber, Secretary; P. S. Dodge, P. T. H. Pierson, H. H. Howe, W. H. Owen, Rev. W. C. Burns, Rev. Charles Nease, C. W. Chapin, John W. S. Pierson, Dr. A. L. Corey, Fred E. Moffatt.

Executive Committee.—Dr. N. E. Bachman, Rev. W. C. Burns, Dr. W. P. Gamber, P. T. H. Pierson, Dr. Henry B. Baker.

Reception Committee.—W. H. Owen, C. W. Chapin, H. H. Howe.

Music Committee.—Fred E. Moffat.

The officers of the convention were:—

President.—Rev. W. C. Burns, Stanton.

Vice-Presidents.—C. W. Chapin, Stanton; C. F. Morgan, M. D., Greenville; Hon. H. H. Hinds, Stanton; W. L. Barnes, M. D., Ionia; Joshua Tennant, M. D., Carson City; Chas. A. Sweet, M. D., Crystal; L. S. Crotzer, M. D., Edmore; Geo. W. Stanton, Sheridan; Arthur H. Forsyth, M. D., Lakeview; Prof. W. N. Ferris, Big Rapids; C. L. King, M. D., Alma; and B. J. Lowrey, Howard city.

Secretary.—W. P. Gamber, M. D., Stanton.

FIRST SESSION, THURSDAY, APRIL 27, AT 2:30 P. M.

The meeting was called to order by the President, who announced that; we will commence the exercises of this afternoon with prayer, by Rev. Charles Nease, of Stanton.

INVOCATION.

Oh, Lord, our Father and our Friend, we thank Thee that we are permitted to gather together here this afternoon. We thank Thee for the object that has brought us here, that Thou hast moved the people in the right direction concerning their own good. We thank Thee our Father that there are those who are willing to come into our midst to teach us, to instruct in the things that are for our good. We thank Thee for the many blessings that Thou hast conferred upon us, for the health we have enjoyed, for the opportunities that have come to us here in this land of many privileges. We thank Thee that no great calamities have come upon us, that we have been blessed, protected and cared for by a kind Heavenly Father. We pray, therefore, at this time that Thou wilt bless us, that Thou wilt so direct the exercises that are before us that Thy name shall be glorified and that good shall come to each one of us.

We ask, our Father, that Thou wilt be with these brethren, these men who have denied themselves to come to this place, that Thou wilt be with them and bless them in the good work which they are doing. We thank Thee that Thou hast put it into their hearts to thus labor. We pray that Thou wilt give them Thy richest blessing, that Thou wilt bestow upon them richest health and happiness that they may be able to go on in this great work and benefit many by their instructions and their teachings. We pray Thy blessing upon these young men and young women that have come in this afternoon. Grant, our Father, that they may early learn the principles of health, that they may be enabled to take care of the bodies that Thou hast given them, that those bodies may grow strong and vigorous that they may be enabled to endure the hardships of life and live long to bless mankind.

We pray that Thou wilt bless the churches, grant that Thy blessing shall rest upon them. Grant that the schools all over our land, and especially our own, shall be blest of Thee, and that the teachers shall be richly blest from Thy hand.

Wilt Thou direct us, we pray Thee, and lead us; forgive all our sins and grant that we may be guided by Thy wisdom in the way of all truth, for Jesus sake, Amen.

THE ADDRESS OF WELCOME.

BY MAYOR N. E. BACHMAN, M. D.

GENTLEMEN OF THE STATE BOARD OF HEALTH:—In extending to you a cordial welcome upon this occasion, I do not wish the few words that I may utter to constitute that welcome.

I sincerely hope that our people will turn out in such numbers to all of these sessions that their presence and attention will assure you that you are not only welcome, but that your work is thoroughly appreciated. Words of welcome must be very tame to your ears by this time, after having held the number of meetings that you have in the various sections

of the State, wholly for the benefit of the people in whose locality you have held them; thus furnishing them with light, information and advice upon subjects, which, if heeded, unquestionably preserves health, increases happiness and wealth, and in very many instances saves life.

Mere words of welcome under such circumstances savor too much of those of the English lord who accidentally fell overboard at sea, and would surely have perished through ignorance of how to conduct himself under the circumstances, had not a sailor seeing his predicament plunged into the water and kept him afloat until the life-boat was sent to the rescue. When all were safely on board the ship again, the Englishman was about to retire to his state room without a word of thanks to any one for his rescue, while the passengers were flocking about the sailor and heaping compliments upon him for the part he had taken in the matter. After looking upon the scene for a moment the Englishman said: "Well, sir, you are 'artily welcome to any distinction or notoriety you may obtain for being instrumental in saving my life."

That the State Board of Health has been instrumental in saving many lives cannot be doubted, to say nothing of the vast amount of sickness and suffering it has prevented by its ever prompt and timely action in case of epidemics and contagious diseases.

Your mission here at this time is not to instruct the people how to heal themselves when they are ill, but to impart to them some of the knowledge resulting from the scientific researches, investigations and developments that have made the Michigan State Board of Health and its co-workers noted throughout the United States, and authority upon sanitary matters throughout the civilized world, wherever the rules of sanitation are observed.

I wish to impress upon the minds of the people that this is not a doctor's convention; nor is it a convention coming here to seek something for its own advancement or benefit; but it comes here for the purpose of enlightening the public upon important matters pertaining to health.

Physicians recognize the fact that by far the greater per cent of the ailments they are called upon to treat are due to direct violation of some hygienic or sanitary law, which might have been avoided; especially does this hold true with reference to children.

Thousands upon thousands of these little ones are constantly passing over the river, from causes which, had the mother or nurse possessed a proper knowledge of sanitation and hygiene, could have been avoided, and the little ones saved from untold suffering and death.

Friends, you cannot afford to lose these meetings; you cannot possibly spend your time in a more profitable manner during this convention than to be right here at every session. Not only come yourselves, but persuade your neighbors to come with you. Fill this church until every seat is occupied and standing room is at a premium.

By so doing you will not only be greatly benefited, but will assure these friends from abroad, who have so kindly come among us, that they are most heartily welcome by the citizens of Stanton, who are wide awake, enterprising and intelligent enough to profit by and appreciate a good work when ever they have an opportunity.

RESPONSE, AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY HON. FRANK WELLS, OF LANSING, PRESIDENT OF STATE BOARD OF HEALTH.

MR. PRESIDENT, LADIES AND GENTLEMEN:—The State Board of Health feel very grateful for the warm words of welcome that we have just listened to. While we might expect a welcome from the mayor, or the town where we are holding a convention of this kind, but it seems a little surprising that a welcome should be extended by a doctor; it appears from this program that the gentleman who is the mayor of this city is also a physician. I was not aware of that fact until I noticed it on the program at this moment. We can, readily understand how a mayor might offer an address of welcome to those who come to a town like this for the purpose of drawing the people out, and endeavoring to have them discuss the laws of health and the hygienic conditions which exist in their neighborhood. That it should come, however, from a physician, as a physician, is surprising; and yet, as we look over this program we find every few lines among those who are to take an active part in it, the name of a physician. Why should physicians take an active part in a work that is going to reduce the number of patients they have and the consequent compensation they are going to receive? That is a question we leave to you. I cannot answer it. But we do know this fact, that, wherever sanitary conventions are held, the physicians are the most active friends we have in promoting them.

The objects of this convention are so well expressed in the program that it seems hardly necessary for me to say anything concerning those objects except, possibly, to emphasize some of them. The calling of a convention of this kind is a significant fact. Two things are indicated by it: first, that wonderful growth of knowledge which is a characteristic of our day, and another is that a large number of the members of a community appreciate that knowledge, and are stimulated by it to have questions concerning health discussed.

The object of the convention, as stated here, is for the presentation of facts, the comparison of views, and the discussion of methods relating to the prevention of sickness and of untimely deaths, not only by those who have come to you from abroad, but by yourselves. The part taken by the State Board of Health is the general one of calling your attention to some of these subjects in which you are deeply interested, such as water supply, sewerage, etc.

A walk we have taken around your beautiful city this morning reveals several things to us. One is that, you have a good supply of water; and it appears to be an excellent quality of water. If we should criticise anything in connection with it, it would be its location, but that perhaps will be talked of by others.

Sanitary conventions are the outcome of the knowledge that has come to the world within the last twenty-five to fifty years. Such conventions would have been impossible, or at least impracticable twenty-five or thirty years ago; any medical convention held at such a time would have been held by medical men, by physicians; they would have considered at such meeting how to cure disease, not how to prevent it. This convention is held for the purpose of comparing the knowledge that we possess and see if that knowledge can be made available in preventing disease.

That it can be is a well known fact to a large number of people; that it may be is a something that we want if possible to impress upon you all. As has been stated by your mayor, this is not a convention of medical men or medical experts; it is not a convention of those who have spent years and years in endeavoring to learn the principals and science of medicine; it is simply to talk over sanitary matters, the main and most important portion of which any of you can understand and make use of.

That contagious diseases have some specific cause was known or believed by physicians perhaps centuries ago. What that specific cause might be is a knowledge that has come within recent years. It has come since the discovery of the microscope. It has revealed that nearly all the diseases, all the contagious diseases, and perhaps a large portion of the diseases that are even now not regarded as contagious, are caused by minute organisms that enter the body and do their work.

These have been studied so far as a great many diseases are concerned, and the theory that these diseases are produced in this way is impregnable. Scarcely any one who has investigated this evidence doubts it at the present day. Nearly all the organisms that produce the various diseases have been studied by those who make that their profession; nearly all of them have been recognized, nearly all of them have been isolated, and diagrams can be shown you here, and probably will be before this convention closes, of the shape, form and mode of action of these organisms.

The most common of these organisms enter the body by three ways: By the air we breathe, by the water we drink and by the food we eat. If these necessities of life could be kept free from organisms which produce disease, the life and health of the community would probably be doubled,—I mean to say that there would not be one-half of the sickness from these causes that there is at the present time. As an illustration of what would be the effect if the food, the air and the water we consume could all be free from the disease germs that infest them, I will state this significant fact: Dr. Koch, of Germany, sent by his government to investigate cholera in Asia, was, with some ten, I believe, of his attendants, in a vicinity where cholera had prevailed among the natives for several months. He and his attendants were compelled to use the same food, drink the same water, and breathe the same air that the natives did. Not one of them had the disease, while the natives were dying all around them. Why? Because every particle of food that was taken by him or his attendants, and every drop of water that was drank by them was recently subjected to a heat sufficient in degree to destroy the life of every organism that was in it. By this simple precaution they were preserved from the disease, and by this same simple precaution you can be preserved from an epidemic sometimes, especially typhoid fever, if you have any doubt of your water or food supply.

I shall not call your attention to any of the further objects mentioned here. I congratulate you upon this convention, and I trust that its discussions and its work may be of the greatest benefit. I hope that the citizens of this beautiful town will turn their faces in the right direction; they can do it, I believe they will do it, and that in doing so they will secure that jewel of health, which is of more value than anything else in the world. Without it everything else in the world is dust and ashes.

After music, the address by the president, was as follows:

PRESIDENT'S ADDRESS.

BY REV. W. C. BURNS, PH. M., STANTON.

LADIES AND GENTLEMEN:—This, as you all know, is an age of conventions. We hold conventions to secure our political rights, to restrain public wrongs, to guard social morals and discuss religious problems. This being true we need offer no apology for holding a convention to discuss the most vital question of all questions, namely, health. We are favored with the presence of men eminent in their profession who have made the study of the human organism, the diseases which afflict and destroy it, their life work. We owe more than words can express to the physicians who in laboratory and study are devising remedies and means to prevent sickness, prolong human life and thus ultimately do away with their own profession.

Prof. Huxley in an optimistic moment said: "The time is coming when a friend meeting another in the street will as soon ask are you honest as are you well?" However that may be, an advance has been made. In the seventeenth century the average period of human life was twenty-four years, now it is nearly fifty, and if the present advancement is continued, it may at no distant day reach a hundred. The fact that a man of a keen, bright intellect who lives only twenty-five or thirty years, would be worth more to society if he continued to live to the hale old age of seventy or eighty, is beginning to be understood. The average age of the most eminent philosophers, naturalists, artists, poets, scholars and divines is about sixty-six years. This fact has frequently been used to show that intellectual pursuits are favorable to longevity. Whereas it shows more conclusively the advantage of taking good care of the body and of making a judicious use of its powers.

Carlyle in a talk to the students at Edinburg, said: "I have this advice to give you, which is practically of great importance. You are to consider more than is done at present, that health is a thing to be attended to continually. You are to regard it as the highest of all temporal blessings. There is no kind of achievement you can make in the world equal to perfect health. What to it are nuggets or millions?"

The Greeks put health so high as to deify it. Hygeia was a goddess, young, smiling and beautiful. We are catching a glimpse of her smiling face and ere long we, too, will exalt her. The careful observer can not fail to note that while political questions fill the columns of the newswapers, yet the eye of the world is fixed on this matter of living. The sanitary condition of cities and homes as well as matters pertaining to personal health and vigor, are attracting more attention than ever before.

Sidney Smith sarcastically remarks that all nations began existence in a pig-sty. This is untrue as regards the Hebrews. No nation has been so exempt from contagious or hereditary diseases as the Hebrews. This racial vitality, this exemption from all infectious diseases, is due to the hygienic rules which Moses made effective and lasting. I venture the remark that if the people who are so much concerned about the mistakes of Moses were to give some attention to some of these measures which are not mistakes, they would be healthier, purer and sweeter.

Advances are made slowly. Every great reform must fight its way up

against the ignorance and prejudices of the masses. The advocates of all great and lasting measures were branded heretics, fanatics, cranks, and were compelled to suffer death in its most cruel form. Today all such are crowned with honor. It is strange however that while we crown the worthy of the past we cannot see and crown with honor the worthy of the present. Pasteur, Koch are names which should be spoken of with reverence.

Our own State Board of Health in point of scientific acquirement, energy and thoroughness of labors is second to none of the kind in this or any other country. In its efforts to maintain public health and to make a high standard of sanitation universal, it has won praise from almost every kindred board in this country and from beyond the seas. Yet there are those who do not recognize its value. They are constantly antagonizing its methods and work. They delight in belittling the noble and scholarly men who constitute its membership. The spirit prompting such conduct and narrowness belongs rather to the mediæval ages than to the 19th century.

While better sanitation has lessened the severity and frequency of pestilences, while diseases do not marshal themselves in cohorts, like the veteran legions of Rome, and march unhindered from continent to continent, yet the black flag of the great destroyer is unfurled over an appalling legion of diseases. Death still lurks in the water, in the sunbeam and the air. Life everywhere pitches its tent over against an enemy. The life of the plant throughout is a battle. The seed must go into the ground with sufficient moisture and not too much. When the germ has formed, it must push its way through the particles of earth, thus doing its first work in overcoming resistance. When above the surface frost may nip it, a bird may pluck it up or an insect destroy it. Other plants may rob it of nourishment and sunlight. It must make its way against the attraction of gravity; and if it becomes high enough to catch the wind, the storm may break it off, the drouth wilt it, or the flood destroy it. Substantially what has been said of plants, may be said of animals. The war among insects, fishes, birds and quadrupeds is war indeed; nor is this preying upon one another an incidental thing. It belongs to the system and is a part of the universal war in nature. Some species are fitted by structure and habit to prey upon others, and without success in securing prey they could not exist. Everything is prey. Every organized body whether confervæ or moss, insect or mammal is an object of prey. The poet was not pessimistic, but only matter of fact when he sung:

> "For nature is one with rapine, a harm no preacher can heal,
> The may-fly is torn by the sparrow, the sparrow is speared by the shrike,
> And the whole little wood where I sit, is a world of plunder and prey."

It is often repeated that man is an epitome of the universe. Man does comprehend the essential elements of all below him with something else beside. This being true, we should expect to find conflict in the grain of his constitution and provided for in the moral and physical elements of his being, nor are we disappointed. Climatic changes, inclemencies of weather are aggressive forces, against which he must nerve himself. His effort to obtain food is contested by animals a little lower than himself. The physical organism of man is a scene of perpetual conflict. There is not an organ in his body that is sheltered from the invasion of parisites. The brain, the ear, the eye, the heart, the lungs and even the blood does not

escape. Indeed a large proportion of the diseases of the human body are caused by microscopic organisms, which poison the currents of life.

Antagonism not only exists in man's physical organism, but it also manifests itself in his mental make up. Mind, says Plato, is a chariot drawn by a team of winged horses, one of which is good and the other vicious. This is but another way of saying that the lower propensities and present impulses are liable to have their way instead of the higher sentiments with their remote and finer gratifications. We have noted the fact that man's nature, physical, mental and moral is a theatre of conflict. Our view has been subjective. Let it now be objective. Let it have regard to environment more than man. Joseph Cook once said, "there are no half hinges in nature, God never makes any such. When he made the fin of the fish he furnished it with water; the wing of the bird with air, and the human eye with light." Organism and environment are complements. In organism lies the principle of life; in environment the conditions. Without the conditions which are wholly supplied by environment, there can be no life. Alone, cut off from my surroundings, I am not, physically. I am only as I am sustained. I continue only as I receive. Seventy per cent of my body is made up of water, the rest of gases and earths, which are drawn from my environment. My environment is therefore an inappropriate part of myself. As such it should command my attention and merit my acquaintance. There are certain things in which man can have no voice, as for instance, the choice of parents, but in environment man can have a voice. It is his to say whether he will drink pure water or foul, whether he will breathe pure air or poisoned, whether he will eat wholesome or unwholesome food, whether he shall purchase adulterated or unadulterated food, and whether the plumber shall be a source of life or of death. Perhaps this statement should be qualified a trifle in view of the fact that thousands of the poorer class cannot command other surroundings than the filthy alley or a home other than the poorly constructed, illy-ventilated and over-crowded tenement.

Man has an inalienable right to life, and wherein he has neither the means nor the power to make his surroundings healthful, he has the right to ask the State to do so.

The State protects the property of its citizens. It educates the children and punishes crime. None of these things are more important than the preservation of health. Health is wealth. Health is happiness. Health is power. The man who can stand in the face of obstacles conscious that he has the power to beat them down is of more worth to himself and society than the weakling. The State owes it, not only to the individual but to itself, that it protect man in the enjoyment of health.

But what has been done in this direction? Practically nothing! The general government spends thousands of dollars in investigating the diseases of animals; in developing the breed of horses; in sending some foolhardy explorer in search of the north pole, or some commissioner of unmeasured egotism and with autocratic power to some far away island of the sea. But when it comes to the prevention of communicable diseases, for the lifting of human beings out of squalor and filth, it draws its purse-strings and hesitatingly doles out a few dollars. A national weather bureau is maintained, but no national board of health.

It is said that at the time of the black plague the houses of Europe were almost exclusively of one room, with neither chimney nor window nor floor. The filth was left to accumulate on the ground, and when it became

unbearable it was covered with a layer of rushes. The condition of things among the poorer classes of the large cities is not much better today. Climb the narrow stairs of some dingy tenament, throw open the doors and the picture is the same in every instance,—a small filthy apartment occupied by a dozen half-fed, half-clothed human beings, who live without regard to chastity or cleanliness. Nothing of the middle ages could have exceeded the filthiness of the rooms furnished by the sweater to slaving subjects. Enter some manufacturing establishment, breathe for a moment the poisoned air, and you will be convinced that there is yet ample opportunity for the enforcement of wise sanitary measures.

Wherein the individual is powerless to remove these unhealthy conditions, it is both the province and duty of the State to do so. So long as the lust of money dominates, human life will be sacrificed. The State must exercise her power; she must lay her hand heavily upon the landlord who makes his unventilated, unsewered tenement house a death trap to needy and desperate humanity; she must deal promptly and severely with the manufacturer who holds in bondage, from early morning till late at night, little children who ought to be playing at their mother's knee; she must be swift in bringing to justice the adulterator of food and drink, whose lying labels cover so many necessary articles of diet and commerce.

Environment is life! Aside from what the State is obliged to do, man can do much himself toward making it healthy. Decaying vegetables, decomposing garbage, better sewerage, purer or boiled water and more oxygen in the house are things possible for him through individual efforts to possess.

It would hardly be true for me to say that man does not love life. On the contrary there is nothing that man would not give in exchange for life. Dr. Talmage, referring to the fountain of perpetual youth, which Ponce de Leon failed to discover, says if there were such a fountain and its waters were bottled and placed on the market at one thousand dollars per bottle, the demand would be greater than the supply.

When we read, however, that one-third of the deaths, each year, occur from preventable diseases, we are inclined to be skeptical of Dr. Talmage's statement. Yet this mortality from preventable causes is due not to any lack of love for life, but to ignorance. There are few things about which the majority of people are so woefully ignorant as hygiene and vital relations of surroundings to health. Disease is regarded as an intruder whose invasion cannot be arrested rather than an effect from some preventable cause.

The crying need of the hour is enlightenment,—a universal dissemination of information on the subjects of sanitation and environment. It is stated that the New York police had much trouble to keep thieves and tramps out of Union Square till they introduced the electric light.

Recognizing that the object of this convention is to enlighten and instruct, let me say to the members of the State Board of Health and to the other gentlemen, who have so kindly accepted our invitation to be present: *Turn on the light*. Impress us with the truth that an ounce of prevention is better than a pound of cure. Teach us how to secure better sanitary conditions; how to dig not only a street sewer, but also a good kitchen drain; how to avoid infectious diseases, and thus enlarge our horizon of happiness, health and life, and we will rise up and call you blessed.

ALCOHOL IN HEALTH AND DISEASE.

BY H. L. BOWER, M. D., GREENVILLE, MICHIGAN.

MR. PRESIDENT, LADIES AND GENTLEMEN OF THE CONVENTION:—My subject divides itself into two distinct parts,—alcohol in health; alcohol in disease. I do not suppose it possible for one to come to absolutely true conclusions upon either part of the subject.

Writers and experimenters have tried, and are still trying to ascertain the exact facts regarding the uses of alcohol, and yet the masses of mankind "are at sea," so to speak, as to how they should regard the article.

The first part of the subject, perhaps, is more easily disposed of than the second. Scientists have not tried so much to prove the good or ill effects of alcohol in health as they have in disease. It has not been worth their while. They have not tried to show it to be a very good thing in health, for the reason that the moral sense of good writers would deter them from advocating the use of an article in health which is by its use made such a weapon of death all the world over. We would apply this statement, however, to modern writers, inasmuch as it has been within the latter part of the last half century that the most of the literature upon this question has been given to the world.

The questions to consider in a sanitary convention are: Is alcohol good or bad to a person in health? Is it good or bad to a person in disease?

We are often led to ask: Why so much talk about the use of ardent spirits? Why so much legislation upon the subject? Why so many organizations formed for the purpose of its consideration? Well, the conditions seen all around us form answers abundant to these queries.

We see the effects on a person, in his servitude to the article. He surrenders himself as to a king. In the majority of such cases distress, broken constitution, poverty, discouraged and disappointed wife, wretched and squalid children, are the effects. A word with regard to this man, as he stands related to the community and the world. Lost to himself, he thus deprives the world of one whom otherwise might be of great benefit; instead of being a good and upright man which the world needs, he is otherwise; instead of maintaining his wife and family, as he ought, he makes them a tax on the community, and they are undesirable citizens; instead of being respected by his neighbors and honored by his family, he is feared by them all; they know not what he may do, as he is liable to destroy their property or take their lives.

But this use of alcohol, one says, is its excessive use; that one in this condition has passed from the moderate to the excessive user. But we would not distinguish between the moderate and the excessive user, for indeed the only distinction one can make is in viewing the effects of its use, for what is moderation in one, may be great excess in another.

No healthy person needs alcohol in any of its forms, whether it be in light liquors, as wine, beer and cider, or in the heavier varieties, as brandy, gin, rum and whisky. No greater error did one ever commit than to suppose that a healthy, robust person needs extra stimulants that he might the better digest his food, and more perfectly perform the duties that come to him day by day. In the ordinary diet of the average man the world over there is provided all the stimulation that is needed. The physical system, unabused, never calls for more. If there be a call, it shows a

depraved appetite, or else disease is showing its work. To illustrate, two persons are reared together, under the same favoring circumstances, blessed alike with sound constitutions, no inherited disease to which they would early fall victims. One grows into manhood contracting the liquor habit; the other is free from it. What is the result? The former has an appetite depraved, he craves additional stimulants; not so with the other; he feels no need of them; he has no need of them.

A most excellent reason why one by nature does not need this stimulant is that nowhere in the wide domain of nature can the article be found. Had it from the beginning been seen to be essential to health, doubtless the author of the universe would have provided it ready made for mankind. To use the words of another, alcohol is the invention of man in the forms we use it, by the destruction of the good food God has given us, and a poet says, by the agency of the devil:

"He joys to transform by his magical spell,
The first fruits of earth to the essence of hell;
Corrupted our food, fermented our grain,
To famish the stomach, and madden the brain."

Then the prohibitions put upon its use by the Almighty would seem conclusive evidence that by nature no one needs it when in health.

The history of our race is corroborative testimony of this fact. For over 2,000 years man got along without it, being total abstainers until the time of Noah, more than 2,000 years B. C.

For aught we know, this is the first account of the manufacture of alcohol, the first account of its use, and it being such a noteworthy fact, the Bible makes especial mention of it. Now if alcohol is a necessary article to use to keep men healthy it would not have fallen to the lot of Noah, more than 2,000 years after Adam, to have, perhaps accidentally, discovered how it could be manufactured. Looking back over those 4,000 years, we say, poor Noah, how lamentable the consequences of thy work, and in this sanitary convention, held in Stanton in the year A. D. 1893, when we are considering the effect of alcohol in health, we point backward through the ages, to the case of the first man who manufactured it; to the first man who used it; to the first fruits of its use, and say of its effects that they are nought else but ruinous and disastrous.

Alcohol affects the healthy human system, both in the body and in the mind. A physical change noted when it comes in contact with the tissues is its power to wrinkle said tissues. By this, the membranes of the stomach are affected, and in proportion to the degree of concentration of the alcohol. This change is effected by the alcohol driving the water out of the tissues. In illustration, a celebrated French chemist, in experimenting, subjected 9.17 grammes of fresh animal substance which contained 6.95 grammes of water and 2.22 of dry substance, to a certain amount of alcohol for 24 hours; then weighing, found the loss to be 4.44 grammes.

But the stomach does not alone share in this corrugation. Absorption of the alcoholic liquid takes place; it is taken up by the blood vessels and carried into all parts of the system. Moreover this work of absorption is exceedingly rapid. The account of an experiment is given by a celebrated physician, showing how quickly the liquid may permeate the body: A sufficient amount of alcohol was injected into the stomach of an animal, it immediately fell lifeless to the ground, the breathing and heart pulsations ceasing within two minutes. On examination the stomach

was found nearly void, while the blood was strongly impregnated with alcohol. In this way the tissues far remote from the stomach share in this corrugating effect, and in like manner become wasted.

Alongside of the physical must be placed certain chemical changes effected by the contact of alcohol with the elements of the body. Prof. Carpenter, a celebrated English physiologist says that "Among the most important of the chemical changes which alcohol has the power to effect is the coagulation of soluble albumen; and although it will rarely if ever be introduced into the mass of the blood, or into the serous fluids of the tissues by any ordinary alcoholic potations in a sufficiently concentrated state to effect this, yet we should anticipate that its presence, even in a very dilute form, must affect the chemical relations of albumen, and can scarcely do otherwise than retard the peculiar transformation by which it is converted into the more vitalized substance Fibrin."

The power which alcohol exerts over the blood claims attention. The blood is produced by whatever is taken into the system: following this it produces bone, muscle, nerve, everything of which the body is composed.

In the order of nature, organized beings are developed and perfected in proportion as the organizable material out of which they are formed is itself perfected. This corrugation of which we have spoken, which alcohol effects, is seen upon the minute blood corpuscles, which are so abundant in the circulating fluid. Their normal form being changed we see how little farther is needed to prevent them doing their perfect work. With these physical and chemical changes vitality is necessarily impaired —hence the diseases entailed upon the vital organs, as of the brain, lungs, heart, kidneys, the nervous system generally, in short, there is nothing about man, which, if touched by its ruthless power, is not poisoned and destroyed.

It were well if its corporeal effects only were seen following its use, but not so, it attacks the mental and makes its victim foolish, deceptive and mad.

As a rule, when one has taken an amount sufficient to stimulate the nerve centers he becomes, it may be, more talkative, lighthearted, very brave, happy; others may become boisterous; others downhearted, morose and sad. Carry this a step farther and his conversation is disconnected, thoughts come to him faster than he can control them; he becomes confused, then foolish. We always say a man is a fool when he gets to such a stage as this. Alcoholism is said to resemble insanity. A person under the influence of liquor is as truly insane as though that terrible disease had taken him. Insanity is a poisoned mind. Whatever that may be, alcoholism in all its stages, as affecting the mental, is said to resemble it. This action, begun upon the brain and nervous system and carried out to a finish, results in one of the most disastrous and heart-sickening, mental troubles of which poor humanity can ever be heir to. For want of time we will pass over much which might be said concerning the slight effects, to the time when alcohol has its victim completely in its grasp. None can better paint a picture of one in the most terrible mental agony, suffering from that terrible self-sought disease, delirium tremens, than the late lamented John B. Gough, hence we reproduce what he has said upon this, found in his autobiography, pages 103–4: "For three days I endured more agony than pen can describe even were it guided by the mind of a Dante. Who can tell the horrors of the terrible malady, aggravated as it is by the almost ever abiding consciousness that it is self sought. Hideous

faces appeared on the ceiling, and on the walls, and on the floors; foul things crept along the bedclothes, and glaring eyes peered into mine. I was at one time surrounded by millions of monstrous spiders, which crawled slowly over every limb, whilst beaded drops of perspiration would start to my brow, and my limbs would shiver until the bed rattle l again. Strange lights would dance before my eyes and then suddenly the very blackness of darkness would appal me by its dense gloom. All at once, while gazing at a frightful creature of my distempered mind, I seemed struck with sudden blindness. I knew a candle was burning in the room, but I could not see it, all was so pitchy dark. I lost the sense of feeling too, for I endeavored to grasp my arm in one hand, but consciousness was gone. I put my hand to my side, my head, but felt nothing, and still I knew my limbs and frame were there. And then the scene would change, I was falling—falling swiftly as an arrow far down into some terrible abyss, and so like reality was it, that as I fell I could see the rocky sides of the horrible shaft, where mocking, gibing, mewling, fiend like forms were perched, and I could feel the air rushing past me, making my hair stream out by the force of the unwholesome blast. Then the paroxysm sometimes ceased for a few minutes and I would sink back on my pallet drenched with perspiration, utterly exhausted and feeling a dreadful certainty of the renewal of my torments." A person in the condition just described is laboring under most excessive effects of alcohol. It is little short of being fatal; carried slightly farther is indeed fatal. A person in a slight debauch has taken an excessive amount. Excess is apparent when any of the primary symptoms are manifested, as hilariousness, etc., should this be repeated again and again, such a picture as he has been given would by and by be witnessed.

However, not all drunkards come to such an end as this. Some may break down under other diseases. Diseases are multiform which are brought on by the same general cause. Many people may suffer the same exposure from cold, some may contract pleurisy, some pneumonia, some rheumatism, while others escape with perhaps no reaction in the system, so the use of alcohol may beget a multiformity of diseases.

A point to be emphasized, moreover, is that alcoholism does not stop with the user himself, but, by the laws of heredity, experts have found mental debility, idiocy, insanity and other diseases in offspring which were traceable directly to dissolute parentage. Our common observation substantiates this fact also. It ought to be so that the battle ground on which all the controversies over alcohol are fought should be right upon this point. Is it good for anything or not in disease? Individual as well as public opinion is getting to the point, it will soon be entirely there, that it is a useless article in health, yet some say that if it be very moderately used it will do no harm; but this expresses a negative effect, and with such an effect a person might a great deal better let it alone. It is doubtless true that the world does not care for what the doctors say of its use in health. If well men want it they will have it, though a thousand doctors stand in the way. Many will fight to get it, though a prohibitory law intervenes between them and the article. In short, people are not using the article any longer for health, but because they like it, or have a depraved appetite which craves it. On the other hand, viewing it as an article used in disease, men everywhere—doctors as well—are saying, where is its proper place, when and how shall it be used?

Personally my experience is somewhat limited, not because opportuni-

ties have not been abundant, but because of an overwhelming desire to use a substitute wherever possible. It is really surprising how possible these substitutes are, if they are looked for. Medical practice has met a wonderful change in the last fifty years, *e. g.*, inflammatory diseases were then treated by blood letting and mercurials; now scarcely a physician fifty years of age has bled a dozen patients in all his life time, for inflammatory diseases, etc.

Then many people endured the characteristic sore mouth, now it is avoided if possible. Who can tell if it may not be said of the physicians fifty years hence that in all his years of practice he has not prescribed alcohol to a single patient.

Chicago has a temperance hospital. The basic principles upon which it rests are, briefly:—

1. That alcohol is a poison.
2. When taken into the system it is not assimilated, but passes the round of the circulation, and is finally thrown off through the organs of excretion unchanged.
3. While passing through the body it disturbs the various physiological processes, and in this way lays the foundation of disease.
4. It does not stimulate or strengthen, but it depresses and weakens.
5. As it is not assimilated it cannot be a food.
6. As it disturbs every physiological process it cannot be a medicine.
7. There is no disease afflicting the body that cannot be more successfully treated without than with the use of alcohol. Speaking of the success which has attended the treatment of surgical and medical cases without alcoholic or fermented drinks, Dr. Charles G. Davis of this hospital says: "The lesson already taught has been sufficiently convincing to impress the most skeptical that alcohol is not only unnecessary as an active medicinal agent, but that, in a majority of cases, it is an actual hindrance to the recovery of the patient. Slowly but surely every year this great truth is being impressed on the minds of the medical profession."

Dr. N. S. Davis of Chicago says that during the last forty-five years he has not prescribed alcohol in any form, for either acute or chronic diseases, internally, and he claims that clinical facts and cases are abundant to prove that alcohol is detrimental to the human system in diseased conditions.

Considering alcohol as a remedial agent in treating disease, we are confronted by the appalling statements of great writers for and against its use. Some laying the claim that it is invaluable in the cure of certain ailments, others that it is worse than useless. In low states of the system brought thus by the ravages of disease, many claim for it benefits as a food and medicine. Others equally learned declare that it does not nourish, neither possesses any remedial virtues. Its friends claim for it great powers for good; in febrile affections, when the patient has been brought into a prostrated condition, that the stimulus spurs the flagging energies of the body, as it were, thus giving them time to recruit their powers, and so return to health again.

Others say that what patients need at such a crisis is warmth applied if needed to the surface of the body and limbs, hot water, milk, perhaps unfermented wine, and other simple, easily digested articles, which will nourish and strengthen the body, taken internally.

A typical chronic disease, which many claim is best treated by alcoholic stimulation, is consumption. The late Prof. George B. Wood, medical

author, was quite inclined to believe that it possesses some virtues, and yet he was so guarded in its recommendation that he declared, rather than reach the state of inebriety, one might better die of consumption. Mr. Thompson, a celebrated English lecturer on pulmonary consumption, does not mention its use in his treatment. We will not generalize further, but in conclusion say, in our humble opinion, that in health we believe it to be a useless article; but that as a remedy to meet certain diseases its use occupies as yet debatable ground. Nevertheless, it being such a weapon of destruction, its place will doubtless, ere long, be filled by remedies far superior and more safe.

As a fitting sentence to close my paper I can think of nothing better than those ancient words:—"Wine is a mocker, strong drink is raging, and whosoever is deceived thereby is not wise."

DISCUSSION OF THE SUBJECT.

Rev. Charles Nease, Stanton: I enjoyed the paper very much, and it seemed to cover the whole ground. I want to say this one thing in reference to one matter mentioned; that is the use of alcohol in consumption. I have known a number of instances in which doctors have prescribed it, and I do not recall a single instance in which the man did not become an inebriate, and it did him more harm than good. As the paper said, he might better have died a little sooner than to have gone the way he did.

Dr. H. L. Bower, Greenville: I, for one, should have liked to hear this question discussed a little more. Our brother Nease is hardly right in saying the ground has been wholly covered. There is an immense distance to travel in this great question.

I especially want to call attention to one remark he made in reference to physicians prescribing alcohol in consumptive diseases. Perhaps there is no chronic disease, and this I almost incidentally mention in my paper, perhaps there is no chronic disease that alcohol is prescribed more generally for than this. Dr. Flint, one of the greatest writers and educators that we ever had in this country (the older Flint), says there is a great deal of benefit derived from the judicious use of alcohol in this disease, and he makes this point, and it is a little different from my friend the professor (excuse me for calling Mr. Nease "professor," he was our professor formerly in the town of Greenville). He says that it is seldom that people do become inebriates that have used alcohol for this purpose. Maybe they died to soon from this terrible disease consumption; if it did not benefit them very much, they died too soon to become drunkards. But I want to say one word upon the question of physicians getting people in the habit of drinking by their prescriptions. Now, as strong a temperance man as I am, I want to defend the profession upon this point.

My experience has been that people do not become drunkards very generally because of an appetite acquired from it as a medicine. I think the profession generally will bear me out in that statement, that it is not so common a thing as people think it is, and especially in the more recent years, for I think about all of the physicians who prescribe alcohol in disease are very careful and advise their patients that when they have got so they do not need it as a remedy to stop it short, stop right off; and I think they are quite successful in getting them to stop right away, too. Now, may be my experience in this direction is not what the common observation is, but I must say this for myself, as I said in my paper, I think that

here are grounds that are still debatable, and I do use it in certain conditions of disease. I do it almost with a protest, it is true, but I am very careful to guard my patrons right upon this point, and tell them that the very moment they do not need it any longer to stop it short, quit it right off. If they use it as a medicine why should men use it any longer than they do any other drug. With the exception of opium, probably, every person when he gets through with the need of a drug stops it short and does not go on taking it. People do not take drugs as a rule just for the fun of it. I want to put the use of alcohol right upon that point and right upon that ground, that as soon as the patient has gotten beyond the necessity for its use then to stop short. And I think the profession is trying all the time with their patients to cultivate that idea with them, to have them stop when they do not need it any longer.

Now, perhaps this opens the road for a little experience meeting upon this subject.

Dr. W. P. Gamber, Stanton: I heartily endorse the remarks of Dr. Bower in regard to the use of alcohol. The more years that I practice medicine the less I use alcohol, and I find that a great many of the diseases for which the remedy is recommended, the patients get along better without it. In those cases in which I use it occasionally, I do so because I do not wish to be too much at variance from the books and best authorities, as it is recommended for a great many ailments. But the use of it in consumption as spoken of by the gentlemen, I think that the effect is a good deal in this way: We have learned from the paper that alcohol does kill many people, and as consumption is one of the diseases caused by one of these little germs, micro-organisms, we can plainly see that if alcohol will kill a man it will kill some of these germs also. But in order to do that we would have to flood the stomach, and thus saturate the system so that we can breath off the alcohol through the lungs, and in this way it probably retards the growth of these germs somewhat. Perhaps in the same way in cases of diphtheria, the use of alcohol retards the growth of the diphtheritic germs in the throat, and physicians have told what good results they get by using large quantities of alcohol in that disease; and it is probably in this way, the large amount of alcohol they have to take retards the growth of these germs.

The medical profession at this day have a long list of articles that are better than alcohol as germicides. For this reason I think the physician who tries to keep up with his profession will discard alcohol and use these better and harmless remedies.

SECOND SESSION, THURSDAY, APRIL 27, AT 7:30 P. M.

MUSIC.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES,—FROM THE STANDPOINT OF A LAWYER.

BY FRANK A. MILLER, STANTON.

MR. PRESIDENT, LADIES AND GENTLEMEN:—In the enforcement of our legislation for the preservation of the public health we find that sometimes the constitutionality of the legislation is questioned. The local health

department or health officer in their attempts to perform their official duties find their authority is sometimes denied. I think that perhaps if those who have thus questioned that authority better understood the fundamental principles upon which all such legislation is founded there would be less difficulty hereafter, for the legislation is founded upon certain fundamental principles, it is a part of the common law of England, and those principles are as old as the common law itself. And upon those same principles is founded every particle of legislation of the State of Michigan, of every state in the union, of every civilized country in the world. Those fundamental principles are known as the police power of the State. Sir William Blackstone defined it, "The due regulation and "domestic order of the Kingdom, whereby the inhabitants of the State, "like the members of a well-governed family, are bound to conform their "general behavior to the rules of propriety, good neighborhood and good "manners, and to be decent, industrious and inoffensive in their respective "stations."

Every law in Michigan in regard to the prevention of public calamities and the preservation of the public health is founded upon these fundamental principles. All property in Michigan is held subject to these general regulations which are necessary for the common good and the general welfare. Every holder of property in this State holds it subject to that implied liability, that his use of it shall not be injurious to others nor injurious to the rights of the community. Upon these same fundamental principles are founded the laws for the public safety, and common good and general welfare.

The legislation which requires physicians to pass an examination before they are allowed to practice; the legislation that requires teachers in our public schools to pass an examination and hold some sort of a certificate as to their qualification, before they are allowed to teach; the legislation that requires lawyers to pass an examination in the laws of their country, and under the rules of the court before they can be admitted to practice, is also founded upon these same principles. The statute which says that a physician who shall prescribe for any patient while intoxicated shall be guilty of a State's prison offense, is founded upon the same general principle. All these laws are based upon this fundamental principle that has never been questioned.

Perhaps the most striking illustration of the exercise of that power you can find in the laws in regard to our liquor traffic. That legislation in some states, Iowa, Maine, and other states that prohibits the exercise of a business that was once lawful, that wipes out a business that was once protected by law as fully as any other business, that made valuable property the next day of meraly nominal value, that made the merchant of today the criminal of tomorrow, that would destroy the building in which he transacted his business, that declared that business, upon sufficient proof, to be a public nuisance, is founded upon this same fundamental principle.

Now, there is no question but what we have law enough in regard to the preservation of the public health. It is defective in some respects, but enforcement of the regulations we have is where the trouble is. We must educate the people up to the idea of enforcing these laws before they can be enforced, or before further legislation would be beneficial. It is necessary first to have the public educated up to these ideas that it is right to enforce these laws. In this country all people are entitled to the right to a trial by jury, but out on the frontier a few years ago, perhaps in some

places now, a man might commit murder and go unwhipped of justice, but if he stole his neighbor's horse, he would, if caught, be hanged to the nearest tree. That simply illustrates this idea.

Now, we have this statute which gives ample authority to boards of health, whenever it is necessary for the preservation of the public health, they have the right to establish pest houses, to compel those who are afflicted to go there and remain, to take them from their home by force if necessary and to compel them to remain in the isolation hospital until the emergency is over. The power is ample to prevent travelers from leaving any locality, or from going anywhere else; to destroy property if need be, to tear down buildings. This power is ample for all these purposes where the necessity exists. We have one statute which I find quoted here in this pamphlet on "Restriction and Prevention of Diphtheria:" "When any person coming from abroad or residing in any township within this State, shall be infected, or shall lately before have been infected, with the small-pox, or other sickness dangerous to the public health, the board of health of the township where such person may be shall make effectual provision in the matter, which they shall judge best for the safety of the inhabitants, by removing such sick or infected person to a separate house, if it can be done without danger to his health, and by providing nurses and other assistance and necessaries, which shall be at the charge of the person himself, his parents, or other person who may be liable for his support, if able; otherwise, at the charge of the county to which he belongs."

Many years ago, in the county of Macomb, the people of a certain township were afflicted by a dangerous disease. Many of the people thus afflicted were unable to pay for the nursing, attendance and physicians. Under this statute the local board of health hired the necessary attendants, nurses and physicians, but in order to obtain them they had to agree to pay prices that were somewhat extravagant. After their bills were audited by the local board and presented to the board of supervisors, some members of the board of supervisors refused to allow these accounts for the reason, as they said, that the law was unconstitutional to compel the board to vote money out of the public treasury when they had nothing to do or nothing to say in regard to the amount. But the parties who presented those bills applied to the supreme court of this State, and the court laid down the rule that it was none of the supervisors business; that the local board of health had authority to provide such means as in their judgment was necessary to meet the public emergency, and the county board had nothing to do but allow the amounts, providing they were satisfied that the patients were unable to pay those amounts themselves. That same point has been raised in various boards of supervisors in the different counties in Michigan. I remember once it was raised in Montcalm county, and some of the members of the board insisted that such a law as that was unconstitutional; and even after they were referred to this decision they still insisted that something must be wrong about it, but such are the laws of this State, they confer ample authority upon the local boards when such an emergency arises.

The charter of the city of Stanton provides that the common council shall be a board of health within and for the city; that it shall exercise all the duties and powers of local boards of health organized under the general laws of the State. Besides that they have authority to establish a board of health, and appoint health officers. They have authority to establish pest houses either within the city or without; they have authority

to destroy property; they have authority to destroy buildings; to prevent persons going about the streets; to prevent people from coming here, and prevent those who are here from leaving, and can do whatever they think necessary for the preservation of the public health. These laws are ample; they are sufficient for all purposes if they were only enforced. Mr. President, it is in such cases as this that we would educate the people up to the correct idea.

We have a law on our statute books in Michigan which makes it a State's prison offence to sell any diseased, corrupt, adulterated, unwholesom provision, but that law is frequently violated, for the reason that the parties who know of such violations neglect to report them to the proper authorities. It is one of the duties of American citizens, one of the duties of every citizen of Michigan, to render all the assistance in his power in the enforcement of all such regulations, especially these. I understand there is now another bill before the present lesgislature in regard to pure food, which it seems to me is a very important matter, which seems to me one of the most important bills pending now before our legislature. I do not think any statute can be enacted too strong, or penalty too severe for those who violate such a law. We have other laws of similar import, for instance, in regard to the location of slaughter houses; providing that they may be destroyed, if necessary; that parties who maintain them at places where they are forbidden shall suffer such penalty, etc. We have a statute which requires every physician, and every proprietor of a hotel or boarding house, whenever to his knowledge any person is sick of any disease dangerous to the public health, to report that at once to the proper authorities, and if they wilfully neglect to do so they are liable to a fine not exceeding one hundred dollars, or imprisonment in the county jail. All such laws are founded on the same general principle.

I have not the time this evening to go over all the various statutes of Michigan in regard to this matter, but they are all based upon this same idea, they are all based upon reason. All such legislation is made with a due regard for the common good and general welfare, and if we do our duty they will be better enforced. If the people better understood the authority of the health officer when they see him coming, they would know they were obliged to obey his reasonable directions.

In conclusion, let me say, that there is no legislation in the State of Michigan giving authority to a board of health or a health officer but what has been upheld as reasonable, constitutional and just, and if we lay ourselves liable to any penalty which is prescribed we must make up our minds that we must suffer, and should not rely on the idea that it is unconstitutional.

All these health laws are reasonable and just, and it rests with the public as to whether they are properly enforced.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES,—FROM THE STANDPOINT OF A MINISTER.

BY REV. CHARLES NEASE, STANTON.

Whatever others may think, it is for me a somewhat difficult matter to determine what the minister's standpoint here is, between the lawyer and the doctor. Surely having his position between such men he ought to

stand erect. Usually in times of epidemic the minister is brought into close relation with the doctor and the undertaker, but it seems that in these sanitary conventions the undertaker has no part. Some one may be thinking that if the undertaker's services were not needed, when contagious diseases sweep through our midst, that the minister's services could also be dispensed with. But not so, death is only one of the many evils which result from the attacks of such diseases as measles, small-pox, whooping-cough, typhoid and scarlet fevers, cholera and that most common of contagious diseases consumption. Many of those whose fate it is to grapple with these dark monsters, come out from the conflict injured for life. Deafness and diseased eyes oftimes result from scarlet fever or measles. Measles and whooping-cough are many times the forerunners of consumption. Any of these diseases is liable to leave one less a man, physically and mentally, than he was before. Therefore, am I here tonight, not to keep these wise contenders for human happiness (the doctor and the lawyer) apart, but to join them in warfare against our common foes,—the children of filth and carlessness, the companions of debauchery and vice.

Our happiness and usefulness depend largely upon the healthy condition of all our faculties and powers. To illustrate, I know a young lady who when but a child, was robbed of her hearing by scarlet fever. She was too young to retain her speech and so she converses with pencil and tablet or by signs. She is now a beautiful young woman, well educated, bright and witty, and a refined christian lady. Her work in art is very fine. Her eye, her hand and her heart are well trained, and she puts many of her thoughts and emotions on paper and canvass; but who can estimate how much happiness she misses by being deaf, or how much good she is kept from doing by being unable to hear and speak. Instances like this might be multiplied but one will suffice for our purpose now.

Suppose that we should take from the blacksmith his hammer and his sledge, and give him in their stead a little pine mallet, how much would he succeed in doing? Let disease rob you of your physical powers, take away your strength from arm and limb and how much of life's work would you be able to accomplish? For the reasons then that these diseases take many out of this life, and rob many more of the ability to make themselves and others happy, and thus prevent their glorifying God and blessing the world, we ought by all means in our power to prevent them from getting a foothold among us, or where they are already in our midst to restrain them as much as possible.

Prevention is better than cure, and in order to prevent these diseases, several rules must be observed: *First*, every individual should carefully obey the laws of health; for physicians tell us that, "The natural fluids and living tissues of the body, when healthy, have the power of destroying a certain limited number of micro-organisms; thus almost every one at some time or other inhales the bacilli of tuberculosis, yet in only a certain number do they develop and multiply."

Cleanliness of person is necessary to this condition of health. Cleanliness is not only next to, but a part of Godliness. Therefore the exhortations of Paul to have our "hearts sprinkled from an evil conscience and our bodies washed with pure water:"* and to "cleanse ourselves from *all* filthiness of the *flesh* and spirit, perfecting holiness in the fear of the Lord." A holy soul will no more live in a filthy body, than a cleanly

* Hebrews 10:22.

woman in a dirty house. As a minister of the gospel I deem it my duty to exhort people to cleanliness in and about the home, that plenty of pure air and sunshine may minister to their health and happiness.

Nature has furnished us a safeguard from many diseases in that she has provided an agent, the gastric juice, to destroy many of the disease germs taken into the stomach. But doctors tell us that the parasites found in the meat of diseased cattle and hogs are not affected by the gastric juice and that only long boiling will destroy them. We cannot therefore be too careful about the milk and the meat which we use.

The gospel of temperance needs also to be preached, for the intemperate man is not in a condition to resist disease. Cholera seeks its victims among the drinking classes.

Restriction is needed where the efforts to prevent have failed. If a contagious disease has entered one of our homes it should be confined there if possible. Therefore the home of the sick should be quarantined, and those who have a contagious disease kept away from all others until all danger is past.

I speak of this for the reason that the doctor's orders are not always obeyed. Children with the whooping-cough are brought to church or sent to school. A light case of scarlet fever is passed over carelessly, simply because it is light, and many are exposed because "the epidemic is not fatal this year." Have you never heard such flimsy excuses given by people for their criminal recklessness?

We cannot be too careful in the work of disinfection after the patient has recovered or died. Dr. John P. Stoddard, of Muskegon, tells of a case of scarlet fever contracted from germs carried in a little flannel shawl for two years.

There is one other practice of which I wish to speak in the strongest terms of condemnation. I refer to the obnoxious custom which prevails with some of kissing the hands or faces of the dead. I know something of the feeling which prompts friends to kiss the form of their loved one, but for their own sakes and for the sake of others it should not be done,—dead lips should never be kissed, much less the lips of him who died from one of these maladies.

Man is a dual being, possessed of body and soul, yet the union is so intimate that he is one person, and if either body or mind suffers the other suffers in sympathy. Therefore, because our happiness and usefulness depends on the healthy vigor of both body and mind, it becomes us to, by all possible means, restrict and prevent the spread of every form of disease.

The violation of the laws of his being has brought upon man many diseases and much suffering. We deem it therefore our duty to preach the gospel of right living, as written in nature and revelation, to all men.

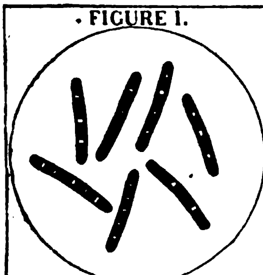
RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES

FROM THE STANDPOINT OF THE HEALTH OFFICER AND PHYSICIAN.

BY W. P. GAMBER, M. D., HEALTH OFFICER OF STANTON.

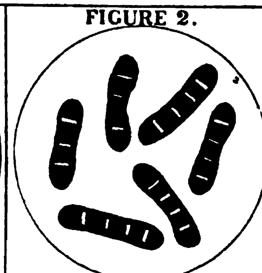
The scientific world for the past two centuries, has been rent with discussions upon the origin of life. Two great schools have defended exactly opposite views,—one that matter can spontaneously generate life, the other that life can come only from pre-existing life. Dr. Bastian, within recent years, revived the doctrine of spontaneous generation, which has caused the highest authorities in biological science to engage themselves afresh upon the problem. Prof. Tyndall and M. Pasteur have been among the foremost in proving two errors in Dr. Bastian's experiments: (1) That he failed to secure complete sterilization by sufficient boiling; (2) That he failed to exclude the external air which is more or less laden with disease germs. This is beautifully illustrated in the home of every family

FIGURE 1.



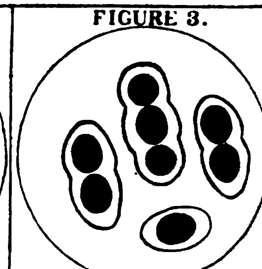
CONSUMPTION.
TUBERCLE BACILLI.
LENGTH 1-10000 IN.
DIAMETER 1-100000 IN.
MAG. 5000 DIAM.

FIGURE 2.



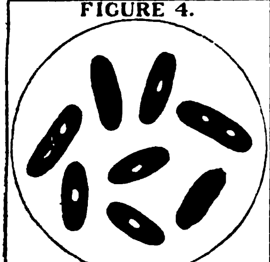
BACILLI OF DIPHTHERIA.
LENGTH 1-10000 IN.
DIAMETER 1-40000 IN
MAG. 5000 DIAM.

FIGURE 3.



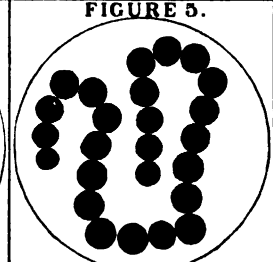
MICROCOCCI OF PNEUMONIA.
LENGTH 1-25000 IN.
DIAMETER 1-35000 IN.
MAG. 5000 DIAM.

FIGURE 4.



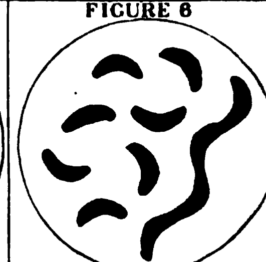
BACILLI OF TYPHOID FEVER.
LENGTH 1-12000 IN.
DIAMETER 1-40000 IN.
MAG. 5000 DIAM.

FIGURE 5.



STREPTOCOCCUS PYOGENES.
" OF ERYSIPELAS.
" OF SCARLET FEVER.
DIAMETER 1-35000 IN.
MAG. 5000 DIAM.

FIGURE 6



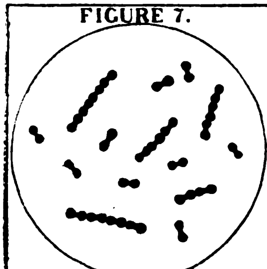
BACILLI OF CHOLERA.
LENGTH 1-20000 IN.
DIAMETER 1-60000 IN.
MAG. 5000 DIAM.

where fruit canning is practiced. You know, in canning fruit, that if you sufficiently heat the fruit and air contained in the can and then hermetically seal it, the fruit will keep indefinitely; on the other hand if the contents of the can are not completely sterilized, or the disease germs of the air are allowed to enter later, the process of fermentation goes on. This process is carried on by what is known as the yeast plant or yeast fungus.* These are oval living bodies and when mature are about 1-3000 of an inch in size, which is the average size of red blood corpuscles in the human system. They multiply by sending out little buds from the mature ones, and so on, each after its kind. It is, therefore, a recognized fact that life can only come from some pre-existing life; we owe our own existence to this same process. This now brings the germ theory of disease before us.

The five dangerous communicable diseases which cause the most deaths in the State of Michigan according to the reports of the State Board of Health, are: consumption, diphtheria, pneumonia, typhoid fever and scarlet fever; and the micro-organisms which are the essential factors in the causation of these diseases by which there is so much destruction to the human family, will, with a few others, be briefly considered.

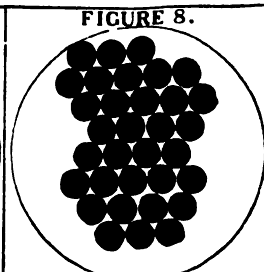
These bacteria, or micro-organisms, may be classified according to shape as follows: spheroidal or oval, called micrococci; the rod-shaped, or bacilli; the spiral, or spirilla. The pathogenic bacteria now known belong to one

FIGURE 7.



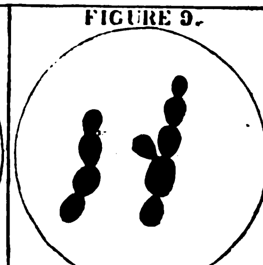
BACILLI OF INFLUENZA OR LA GRIPPE.
LENGTH 1-50000 IN.
DIAMETER 1-110000 IN.
MAG. 5000 DIAM.

FIGURE 8.



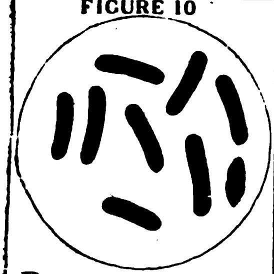
STAPHYLOCOCCUS PYOGENES AUREUS, OR PUS-COCCUS.
DIAMETER 1-35000 IN.
MAG. 5000 DIAM.

FIGURE 9.



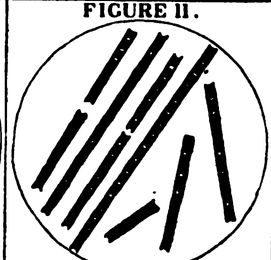
YEAST FUNGI.
DIAMETER 1-3000 IN.
MAG. 500 DIAM.

FIGURE 10



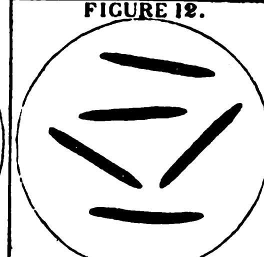
BACILLI OF GLANDERS.
LENGTH 1-12000 IN.
DIAMETER 1-60000 IN.
MAG. 5000 DIAM.

FIGURE 11.



BACILLI OF ANTHRAX.
LENGTH 1-3000 IN.
THICKNESS 1-25000 IN.
MAG. 2500 DIAM.

FIGURE 12.



BACILLI OF LEPROSY.
LENGTH 1-6500 IN.
DIAMETER 1-100000 IN.
MAG. 5000 DIAM.

*Fig. 9 will be found in plate on page 27.

or the other of the above-described genera, and the attention of bacteriologists has been given, chiefly, to these three forms. They multiply by division, one cell making two. It is estimated that the slowest double in twenty-four hours, and the fastest multiply from one rod to 16,500,000 rods during twenty-four hours. Their condition for growth demand moisture, heat, and organized food. The temperature for rapid growth is blood heat, 98° F. This growth is diminished as the temperature is reduced or raised. Death of many of them takes place at boiling-point, while others are all but fire-proof. Freezing does not destroy them but they are simply inactive.

In the two foregoing plates are exhibited twelve specimens of micro-organisms, magnified approximately as stated in each instance.

The figures denoting the real lengths and diameters are the average measurements of each species. The drawings were made from Dr. Geo. M. Sternberg's Manual of Bacteriology, and were prepared by W. P. Gamber, M. D., Stanton, Michigan, the author of this paper.

The bacillus of tuberculosis (Fig. 1*) is the principal factor in the disease so commonly known as consumption, and is the cause of more deaths in the State of Michigan than any other single disease. Their shape is in the form of rods with rounded ends; average length, 1-10,000 of an inch; diameter, 1-100,000 of an inch. The bacilli are said to have an enduring form, and it has been demonstrated by experiment that it retains its vitality in desiccated sputum for several months. A susceptible individual may take this disease through an open wound, or an abrasion of the skin; but the respiratory tract furnishes the best medium for infection. A very common mode of infection, especially in children, is from the ingestion of milk from cows affected with tuberculosis. The temperature for the growth of this germ is 99° F., and they multiply slowly. The thermal death-point is 160° F.

The bacillus of diphtheria (Fig. 2†) is the specific germ of that dreaded disease, diphtheria. They are rod shaped, straight or slightly curved, with rounded, club-shaped ends, having a length of 1-10,000 of an inch, and a diameter of 1-40,000 of an inch. Infection may take place from inhaling the poison, or where there is an abrasion of the skin; also from the food taken, and especially milk, which is a favorable medium for the growth of this bacillus. The development takes place at a temperature of from 70° to 107° F.; the most favorable temperature is 95° F. The thermal death-point is 140° F. The diphtheria germs have a great tenacity to life, may remain virulent for many months and tolerate the exposure to rain and sunshine during the months of April and May.

The micrococci of pneumonia (Fig. 3)† are spherical or oval, usually united in pairs, or in chains consisting of three or four elements, which are surrounded by a transparent capsule. In length they are about 1-25,000 of an inch; diameter 1-35,000 of an inch. Infection from this micrococcus takes place through the medium of the respiratory passages. These germs are found in the saliva and nasal secretions in many persons in good health for days and weeks at a time,—perhaps are there waiting for the lungs to become irritated from a cold or from epidemic influenza so that it may cause its own specific disease, pneumonia. Blood heat, 98° F., is most favorable for their growth. The thermal death point is 130° F.

---

* Fig. 1 will be found in the plate on page 26.
† Fig. 2 and Fig. 3 will be found in the plate on page 26.

The bacilli of typhoid fever (Fig. 4*) have an average length of 1-12,000 of an inch, and a breadth of 1-40,000 of an inch, with rounded ends. Their growth is most rapid at blood heat; thermal death point, 140° F. They are long lived and will endure most any kind of weather, and find their way into the system through the medium of drinking water, milk or other food.

The pathogenic micro-organism of scarlet fever (Fig. 5†) has not, as yet, been fully demonstrated, but some good German and French authorities found in all these cases examined, a streptococcus identical with the streptococcus of erysipelas (International Medical Magazine, April, 1892, page 323). Sternberg says: "In the diphtheritic exudate frequently seen in the angina of scarlet fever a streptococcus is commonly found which appears to be identical with streptococcus pyogenes." Baumgarten believes these germs to be varieties of the streptococcus pyogenes. So that at present there seems to be no good reason for doubting that this is the specific infectious agent in scarlet fever, and enters the system by the mouth and nasal passages.

We now wish to give a moment's notice to this micrococcus that is so closely resembled by that of scarlet fever. The streptococcus pyogenes (see also fig. 5†), is the specific germ in our severe cases of blood poison, and can not be identified from the streptococcus of erysipelas, but bacteriologists observe that the effects produced by them are somewhat different, as proven by the inoculation of the lower animals with artificial cultures of these germs. They are spherical in form, with a mean diameter of 1-35,000 of an inch. They multiply freely at ordinary room temperature, 60° to 70° F., but more so at blood heat. Thermal death point is 130° F. This is also called the chain-coccus, on account of the arrangement in more or less elongated chains. Its peculiarity is to extend rapidly along the lymph spaces and lympthatic vessels; and if it commences about the hand it extends up the arm, and may cause progressive phlegmon, and often death, if radical measures are not taken to prevent it.

The staphylococcus pyogenes aureus, or golden staphylococcus, also called grape-coccus (Fig. 8‡), differs from the chain-coccus in the respect that it is not apt to spread, but is found in boils, carbuncles, and various local abscesses; hence it is the most common pyogenic micro-organism. They are spherical in form, same size as the chain-coccus, are arranged in groups, and multiply rapidly at a temperature of from 65° to 70° F., but more so at blood heat. Thermal death point, 140° F.

The conditions being favorable, infection may take place through the normal skin, this germ producing furuncles, and, if it is the preceding or chain-coccus, causing blood poison, or erysipelas, which is only another form of blood poison. Infection takes place much more readily when there is an abrasion of the skin, especially, if the standard of health is reduced from any cause. Both the chain-coccus, known as the streptococcus pyogenes, and the grape-coccus are called pus-cocci.

The spirilla (bacilli) of cholera (Fig. 6§) are curved rods, with rounded ends, from 1-20,000 of an inch in length to 1-60,000 of an inch in breadth, and grow at a temperature ranging from 60° to 105° F. Thermal death point is about 140° F. Source of infection is similar to that of typhoid fever.

* Fig. 4 and Fig. 5 will be found in the plate on page 26.
† Fig. 5 will be found in plate on page 26.
‡ Fig. 8 will be found in the plate on page 27.
§ Fig. 6 will be found in the plate on page 26.

The pathogenic bacillus of influenza, or la grippe, (discovered by Pfeiffer) is found in the purulent, bronchial secretions of those suffering from this disease in its epidemic form. You may not desire to become intimately acquainted with this very small fellow, but he is entirely harmless upon paper. (Fig. 7*). They are very small bacilli, solitary or united in chains of three or four elements, and consist of two bulbous ends joined by a narrow central shaft. It has never been known to be present in any other malady. Its length is 1-50,000 of an inch; diameter, 1-110,000 of an inch; usually short lived and drying quickly destroys them. Thermal death point is 140° F.

So far as is known, none of these bacteria already mentioned have spores, and are all destroyed by ten minutes' exposure to a temperature not exceeding 160 ° F., while those having spores, such as the anthrax bacillus, require the boiling point (212° F.,) for their destruction, and is a safe rule to follow in the destruction of all of them.

Now, having studied the nature of these specific, or pathogenic, microbes of these diseases, we are better prepared to study measures for the prevention and restriction of the dangerous communicable diseases; and in this class, as mentioned by the State Board of Health, the infectious material, as contained in the secretions and excretions, is diffused, chiefly, from the following sources:

(1) Consumption; the expectoration from the lungs, and sometimes the discharges from the bowels.

(2) Diphtheria; from the mouth, throat and nasal passages.

(3) Pneumonia; from the lungs.

(4) Typhoid fever and cholera; the discharges from the bowels.

(5) Scarlet fever and measles; from the mouth, throat, nasal passages and skin.

(6) Whooping-cough; the expulsive breath from the air-passages; also from the sputa.

(7) Small-pox; from the pustules, chiefly, of the skin.

As to small-pox, its contagion is very diffusive, and continues for a long time in the scabs of the pustules.

Scarlatina, scarlet rash, or scarlet fever, all of which are identical in meaning, is probably conveyed by the peeling skin longer than by the breath, but is not so diffusive as small-pox or measles.

Diphtheria is not communicable at long distances, except in very close rooms. The membrane itself is the most dangerous source of contagion, particles of which may be carried and impart the disease at almost any distance if there is not full exposure to air. " A brush used to swab the throat of a diphtheritic child, was put aside in a drawer uncleaned: after four years it was taken out and infected a man who used it."

"In a Normandy village, twenty-three years after an epidemic of diphtheria, some of the bodies of those who died of the disease were exhumed, and an epidemic at once broke out, first among those who opened the graves, and extended to others" (Pepper's Theory and Practice, 1st Vol. 1893).

Measles and whooping-cough are very communicable, and probably more so because the cough tends to propel and diffuse the breath laden with infective germs.

The specific germ of whooping-cough has been discovered but not fully illustrated; those of small-pox and measles have not, as yet, been identified.

* Fig. 7 will be found on page 27.

In all of these contagious and infectious diseases, isolation, thorough disinfection of all the secretions and excretions, cleanliness of person and things, good ventilation, good and pure water supply, a proper disposal of waste and excreta, and a good sewerage system, are among the important steps in their restriction and prevention. It is not sufficient to keep your front yard as a velvet lawn, beautifully fragrant and as clean as your floors within, and allow the back yard and privy vault to tell the story of shiftless house-keepers and irresponsible help. Cleanliness in person may also apply to those receiving cuts or any abrasion of the skin. These wounds should be thoroughly washed with water that has been sterilized by boiling, to cleanse the parts, followed by a good clean dressing (and not a variety of filthy poultices). This will protect you against erysipelas, blood-poison, diphtheria and many other infectious diseases. Air, water and a variety of other articles may carry the disease germs to the affected parts. The specific poison of erysipelas finds a suitable resting place in garden soil, so it is not always a good rule to follow the old adage of handling your tools without gloves.

As a rule, in most of the dangerous communicable diseases, it is quite easy to carry out the necessary steps for their restriction and prevention. This is particularly true when the patients are confined to the bed, but when they are able to be about, as many people with consumption, they flock to unscientific health resorts. The patients are allowed, in most hotels, to expectorate where they choose without restriction; the result is, germs are scattered broadcast in the buildings and outside on the grounds, they become dry and are scattered in the air, and are inhaled by those exposed.

In one hundred typical cases of consumption studied by M. Arthaud, the inocculation of eighty of them were attributed directly to occupying rooms previously occupied by consumptive patients. This shows the necessity for every hotel keeper and others to be on their guard and to disinfect thoroughly their premises after having been occupied by this class of patients.

To this class we may add those who are commencing with an attack of diphtheria, scarlatina, measles or whooping-cough. These patients many times travel about and distribute their salivary secretions in public and private places, in cuspidors or on floors, in street cars and those of the great railways, in concert halls and theaters, and on the streets, in the wind which blows it into the passer's face. They drink water from the cups in these public places and you put the same cups to your own lips and become infected. The shoes of men, and the robes of ladies, as they trail upon the floor, gather up these germs and convey them to the carpets of our homes, where they become dried, and enough of this septic material is diffused in the room to infect the whole household.

People in apparent health cannot be too careful in the disposition of their salivary secretions; all saliva is not harmful, yet the American dentist, Miller, now of Berlin, has isolated some twenty kinds of bacteria from the mouth.

The highest powers of the microscope have been instrumental in cultivating ideas which are bringing about a true system of etiquette founded upon the Golden Rule. For the cultivation of this humanitarian politeness the individual must have regards to the best interests of the human beings with whom he comes in contact. Dr. Isaac N. Himes, professor of

pathology in the Western Reserve University, medical department, says: "Will people continue to spit out their venomous saliva, or will they cremate it after it has been received upon the absorbent surface of a paper handkerchief which has been rendered anti-septic? We have sewers for the reception of other human excreta, and why not, when it is necessary, by ejecting it, to degrade this proper secretion into an excretion, resort to cremation of it, in order to render it harmless?"

It was not very long ago that Dr. T. M. Prudden, a New York bacteriologist, asked this question: "Shall we not have a society for the prevention of expectoration?" Since that the ladies have taken the matter in hand and what the American woman sets her mind on doing she generally manages to effect. Mrs. John M. Oakley, of Pittsburg, secretary of the Women's Health Protective Association, of Allegheny county, announces (in the New York Medical Record) that she and the body of which she is an ornament have been fighting the spitting nuisance by organized effort for more than a year. "By ceaseless importunity," she says, "we have induced the managers of the street car companies to post placards prohibiting spitting in all their cars, and a noticeable improvement in the condition of these vehicles has already been effected." The Pittsburg, Cincinnati and St. Louis Railroad and the Allegheny Valley Railroad have placed notices in their stations, and it is hoped that the other railways will in time follow their example. A notice specially prepared by the State Board of Health, pointing out the sanitary dangers of indiscriminate expectoration, will soon be posted in every school room in Pittsburg, and the teachers are to be instructed to preach to their pupils every week from the text supplied by this notice. Dr. Isaac N. Himes says in regard to this society: "It is hoped to effect in this way a reform, so that we may not be obliged to be seated over a pool of excretory filth, left by a previous passenger, when we make a journey on a line of railway. Such a society would have a very commendable field of work here as well as at other points on the continent."

We may now ask: What are our further duties in preventing the dangerous communicable diseases? Perhaps enough has been said in regard to each and every one caring for their own individual homes, but there are many duties which we owe to our neighbor. To promote and preserve health is something that should interest every person, not only in his own family, but, also, that of his neighbor. We have no just right to throw filth out of the back door, or pile it up on the back end of our lot, where our neighbors get the foul odors.

It is the duty of every citizen to coöperate earnestly with the physician, health officer, and local board of health, in properly reporting the dangerous communicable diseases, and various other nuisances which may be considered detrimental to the best interests of health.

The physician, health officer, and the local board of health should also earnestly coöperate with the State Board of Health in this good work.

All these things properly carried out, and a continuation of the popular education through the means of these sanitary conventions, by which method we are enabled to disseminate useful knowledge, we can soon hail the day when we will be able at all times to step from our door and breathe Nature's pure air, and to partake of Nature's most wholesome beverage, pure water, unpolluted and uncontaminated.

TABLE OF GERMICIDES AND ANTISEPTICS.

		Corrosive sublimate, one part and water, parts as follows:—	Carbolic acid, one part and water, parts as follows:—	Sulphuric acid, one part and water, parts as follows:—	Hydrochloric acid, one part and water, parts as follows:—	Salicylic acid, one part and water, parts as follows:—	Boracic acid, one part and water, parts as follows:—	Nitrate of silver, one part and water, parts as follows:—	Caustic soda, one part and water, parts as follows:—	Iodine, one part and water, parts as follows:—
Bacillus of tuberculosis	Destroys vitality in 1 minute	1,000	100			40, in 6 hours.				
	Restrains development	1,400								4,000
Bacillus of diphtheria	Destroys vitality in 2 hours	5,000	300	500	700			2,500	800	
	Restrains development	14,800	500	2,050	8,400			60,000		4,000
Micrococcus of pneumonia	Destroys vitality in 2 hours	20,000	100	200	200				50	1,000
	Restrains development	40,000	500	800		400	400			4,000
Bacillus of typhoid fever	Destroys vitality in 2 hours	10,000	200	500	300	700, in 5 hours.	400, in 5 hours.	4,000		
	Restrains development		400	1,550	2,100			50,000		
Streptococcus pyogenes	Destroys vitality in 2 hours	2,500	300	250	250	200			130	
	Restrains development	30,000	8,000	800	800	700	143	12,500		4,000
Stapylococcus pyogenes	Destroys vitality in 2 hours	2,500	125	200	200	200	30			500
	Restrains development	80,000	800	800	800	655	327	12,500		4,000
Spirillum of cholera	Destroys vitality in 2 hours	10,000	400	1,300	1,350	800, in 5 hours.	700, in 5 hours.	4,000	150	
	Restrains development		600	7,000	5,500			50,000		
Bacillus of anthrax	Destroys vitality in 2 hours	10,000	300	1,300	1,100			20,000	450	
	Restrains development	300,000	750	2,550	3,400			60,000		
Bacillus of glanders	Destroys vitality in 2 hours	5,000	300	200	200			4,000	190	
	Restrains development		500	750	700			75,000		

The above table shows a variety of chemical agents which, when one part of the same is used to a certain number of parts of water, act as germicides in two hours time, except as noted; and, when used in weaker solutions, as shown in table, they restrain development. The table is compiled mostly from Sternberg's Manual of Bacteriology, while part of it is taken from Pepper's text book (latest) on the practice of medicine.

DISCUSSION OF THE SUBJECT.

Mr. Wells, Lansing: I regret exceedingly that I have been called upon to lead in the discussion of this subject. I am sorry that Dr. Avery, who I am sure would have interested you on this topic, is absent. Since the meeting this afternoon I have been asked to say something in opening this discussion. I shall, I think, confine myself to considering the work done by the State Board of Health in endeavoring to prevent the introduction of cholera and other dangerous diseases into Michigan.

The State Board of Health, soon after the proclamation of President Harrison in August, last year, issued a quarantine order. You all know the history of the proclamation of the president. The proclamation of the Michigan State Board of Health was in September, and it was similar in terms to the proclamation of the president. It was intended to apply to immigrants seeking a passage into or through this State coming by the way of Canadian ports. The proclamation of the United States did not necessarily apply to these ports. Immigrants on their way to the northwest pass through Michigan. It seemed important if not absolutely necessary that this State should take steps for the thorough inspection of passengers, immigrants and disinfection of baggage. Our Board placed inspectors at all ports on the Michigan-Canadian border, with instructions that no immigrant be permitted to pass through the State except by permission of the State Board of Health, and this permission was promptly granted to healthy immigrants, after their baggage had been disinfected. Soon after this, we found that immigrants were permitted to pass through the ports of the United States with a mere form of inspection, and without any disinfection of baggage. The same was true of Canadian ports. We have therefore kept up our inspection of immigrants from all Atlantic ports and disinfection of all baggage to the present time, although we have had difficulty in maintaining it at one port, Sault Ste. Marie.

A meeting of delegates from all of the State boards of health was called at the city of New York; it met about two weeks ago, and was a very important meeting. Dr. Wyman, who is the Surgeon General of the U. S. Marine Hospital service, health officer Dr. Jenkins of New York, and a great many others interested in this work were present. After a free interchange of opinion, a resolution was adopted expressing the importance of carrying out the object that has constantly been sought by the Michigan State board of health,—that no immigrant's baggage should be admitted to the United States unless it has had a thorough disinfection.

After the conference we were invited to go to the immigrant station on Ellis Island. As you are probably aware, the old immigrant station at Castle Garden is abolished now, and the immigrants are taken to Ellis Island, that having been acquired by the United States. We went there, and witnessed the very interesting procedure of receiving immigrants. The main room for this purpose is a very large one, and is divided by railings, or fenced off into several compartments, and between these compartments runs a narrow passageway, something like this aisle, between the desks of the inspectors. As the immigrants enter and pass through they are scrutinized, first by a woman, and then by the medical inspectors, as they pass down to take their places in the room beyond this alley, where a large number of clerks are writing at desks to report the various facts connected with the immigrant as prescribed by the immigration laws of the

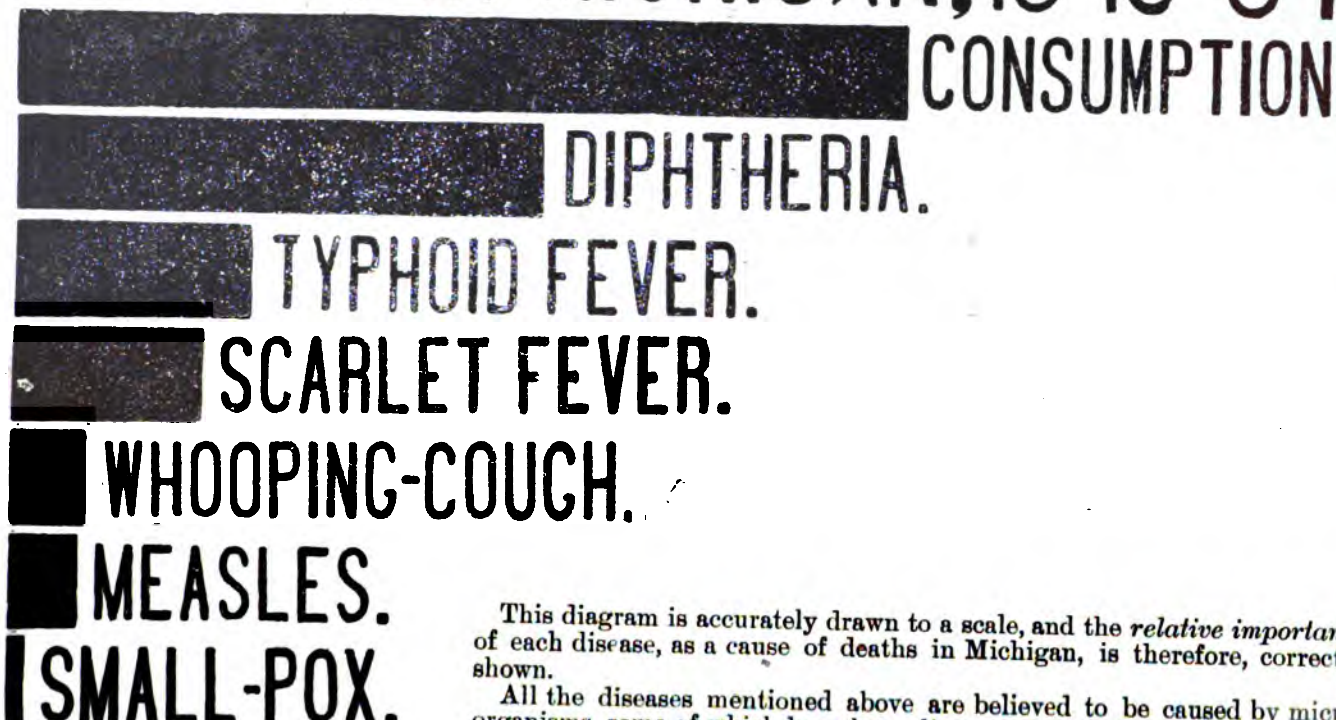
United States. If in passing, these inspectors should think any of them are liable to become a public charge, or are sick, they are immediately set aside and moved into one of the other rooms and remain there for further inspection. If it is learned that any have perpetrated a criminal offense involving moral turpitude they are not permitted to pass. Under the recent laws of the United States none but immigrants who there is reason to believe will make good citizens are allowed to pass and become citizens.

We went below to see the baggage, and we learned that all sorts of absurd things were sometimes brought over by the immigants; one chest was found to be filled with turnips and beets. The reception of the immigrants at Ellis Island, you will understand, is by the United States. The general government is capable of doing everything to carry out its laws, and see that none but good citizens are admitted to citizenship in this country. But the quarantine plant is owned by the State of New York. From Ellis Island we went to the State quarantine institution. It is ridiculous, absurd, to think that the great State of New York, standing at the gateway of this great nation, should have nothing better to offer in the way of the disinfection of baggage of the thousands of diseased immigrants who come through there weekly than they have. Not only that, but they do not use what they have. They say it is not adequate, and that is quite evident. They are making efforts to secure from the legislature an appropriation to give them more facilities; but pending that they are doing almost nothing. A resolution was passed by the national conference of State Boards of Health, censuring them heartily.

Dr. Baker, Lansing: I think the ground has been quite well covered, but what I would like to do would be to touch up a number of points, if I can in the limited time that I ought to occupy, bearing in mind that we have an all important paper to follow this. If I jump from one subject to another a little, I hope you will pardon the rapid movements.

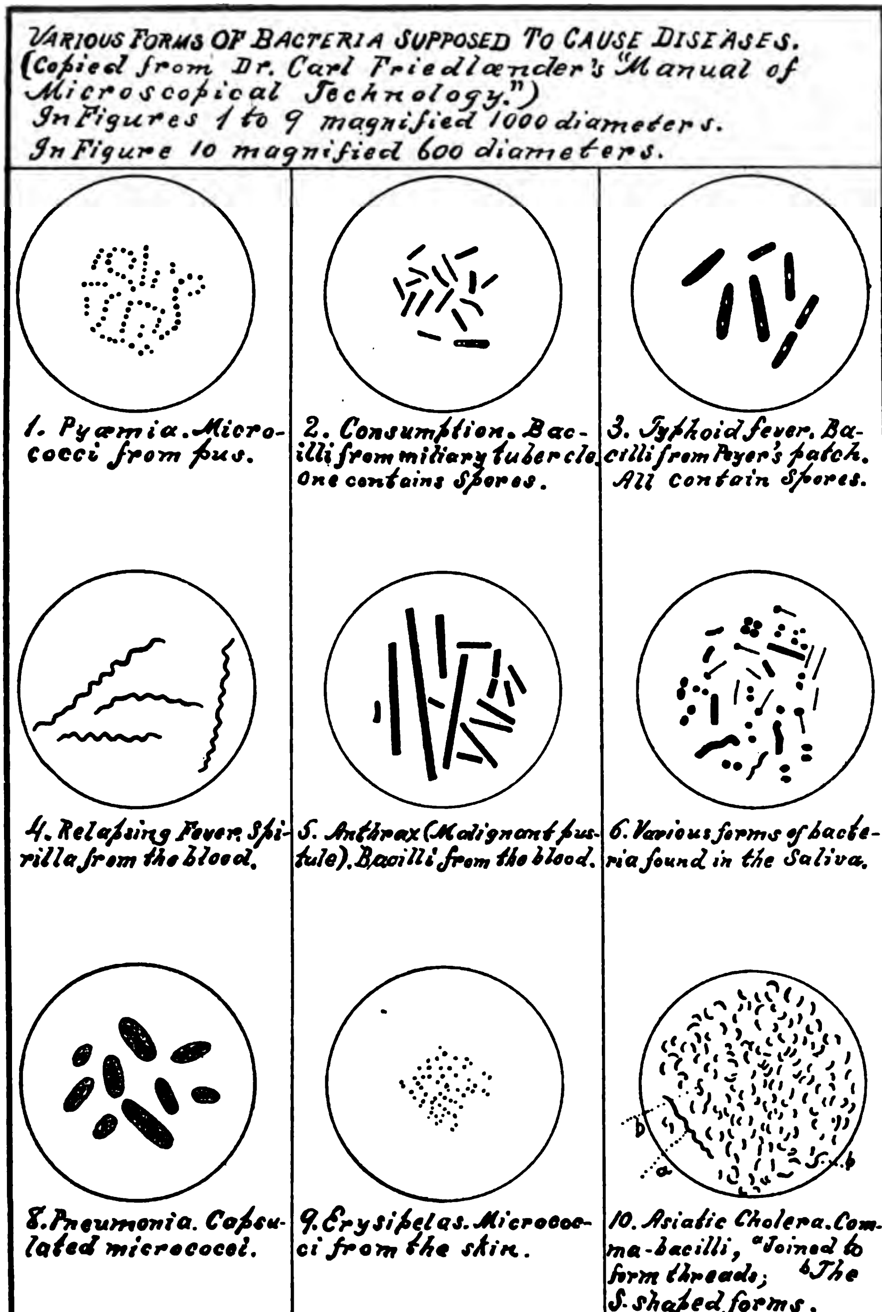
First I want to speak of the importance of the work mentioned by Mr. Wells, from my standpoint. It is this, that we have no typhus fever in the United States, except it be brought to us by immigrants. We have no yellow fever now in the United States, except it be brought in from without. We have no cholera, except it be brought in from some other country. I think we can say that we have no smallpox, except it be brought from some other country, and I want to say that if the constant and repeated introduction of the diseases which really cause the most deaths among us could be prevented we would have very much less than we have now,—from diphtheria, typhoid fever, and scarlet fever, hence I would like to impress upon you the importance of the subject under discussion this evening; and I would like to speak upon the importance of the subject in another regard; the subject was mentioned by Dr. Gamber, but I would like to repeat the idea that, of the "dangerous communicable diseases" there are about five of them that stand at the head of the list of diseases which cause the most deaths in this State. The first in rank is consumption; that is a dangerous communicable disease, and it causes the most deaths. Next to that is diphtheria; then pneumonia, typhoid fever and scarlet fever, in the order named. During the 11 years from 1876 to 1887 those were the five diseases which caused the most deaths in this State. I will not say it is true today, but it was true from 1876 to 1887. Those diseases are all dangerous, and all preventable, and yet those diseases were the five that caused the most deaths in this State. I mention this fact for the purpose of showing the relative importance of this subject, and the

DEATHS IN MICHIGAN, 1876-'87.



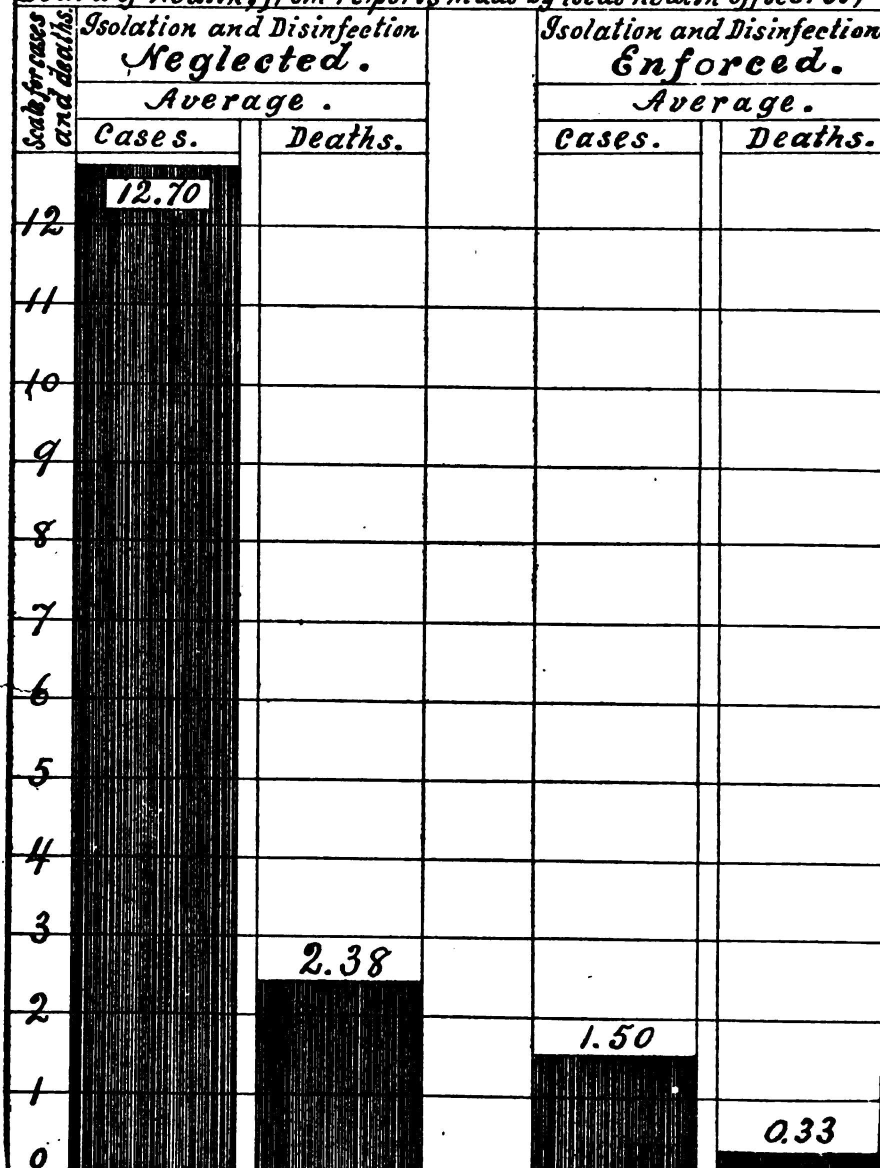
This diagram is accurately drawn to a scale, and the *relative importance* of each disease, as a cause of deaths in Michigan, is therefore, correctly shown.

All the diseases mentioned above are believed to be caused by micro-organisms, some of which have been discovered, and drawings of them are exhibited on the reverse side of this leaf. They are printed on page 37.

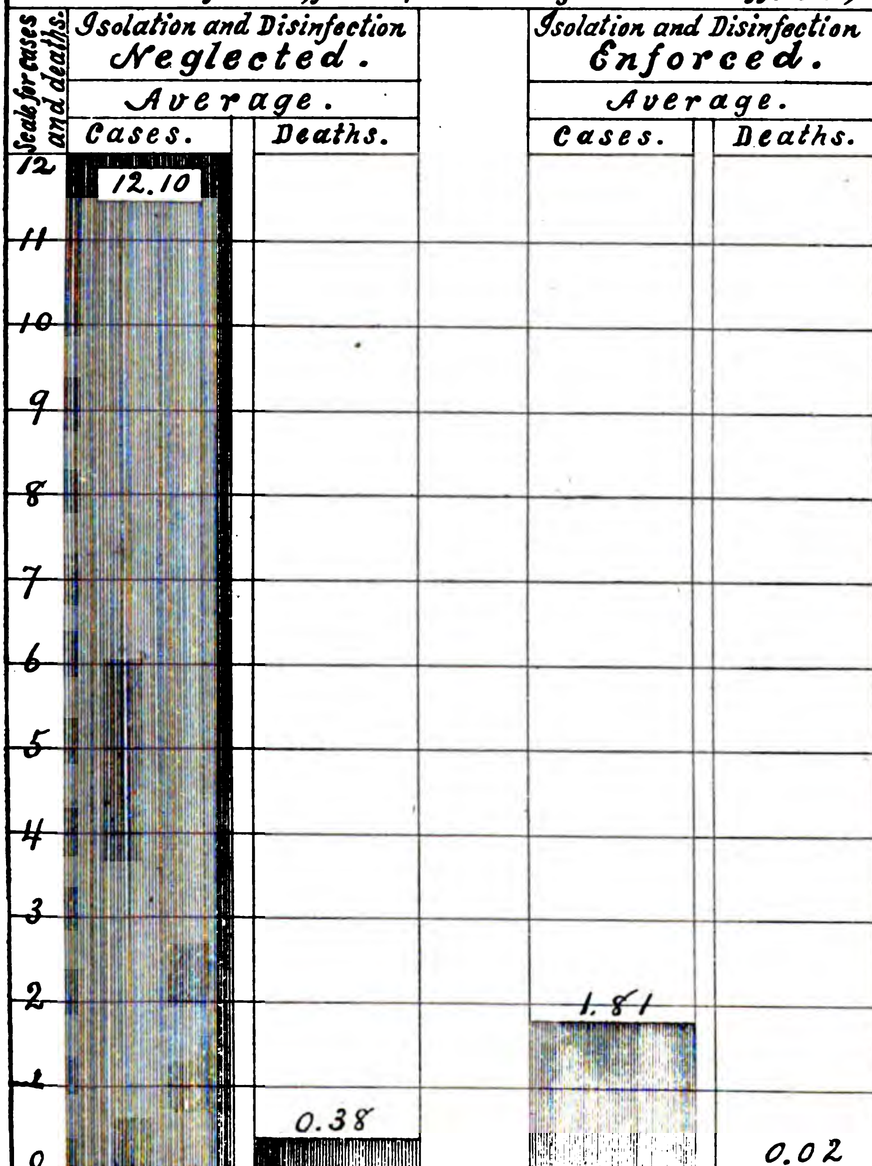


Prepared to illustrate "History of investigations Concerning Micro-Organisms." By Mr. Frank Wells.

Diphtheria in Michigan in 1890:-Exhibiting the average numbers of cases and deaths per outbreak:-in all outbreaks in which Isolation and Disinfection were both Neglected; and in all outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



Scarlet Fever in Michigan in 1890:- Exhibiting the average numbers of cases and deaths per outbreak:- in all outbreaks in which Isolation and Disinfection were both Neglected; and in all outbreaks in which both were Enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



relative importance of the several diseases. It seems to me that it is important that we understand the principal things in sanitary science. Consumption is far ahead of anything else that can be mentioned; cholera, typhoid fever, small-pox, typhus and yellow fever do not stand anywhere near it. Consumption is the great "White Plague" of this country, but it is a preventable disease, and easily preventable under our present knowledge of it. Small-pox was formerly at the head of the list, now it is near the foot of the list. This diagram* is accurately drawn to scale, the bottom line represents the deaths from small-pox for those years; now you see but few deaths from that cause; it is an insignificant cause of death. That this disease can be prevented is not guesswork any longer.

I have here a diagram † which is accurately drawn to scale, and which represents the experience in this State in the restriction of diphtheria, and if there was another diagram besides that and made almost like it the same would be true of scarlet fever.‡ There are two things which need to be done to restrict diphtheria, namely: Isolation and disinfection—disinfection of all things, especially after the death or recovery of the person. This first column you see represents the average number of cases in those outbreaks in which isolation and disinfection are neglected; and this second column, where they are not neglected. About five times as many cases die in those outbreaks in which those two measures are neglected as in those where they are enforced; and the same is true of scarlet fever.

I want to have you fix firmly in your mind some points, mentioned by Dr. Gamber, as to the mode of the spread of this disease. He mentioned several ways in which diseases spread, and I hope you followed him carefully, and will not conclude that you can get any one of *these* diseases—consumption, diphtheria, pneumonia or scarlet fever from decomposing organic matter, or garbage. These diseases are not reproduced outside of the body at any ordinary temperature; he stated to you the temperatures at which they are reproduced. The specific cause of consumption, as a rule, is reproduced in the inside of the human body; although, as he said, it may be communicated by animals. It is spread as a rule by the sputa of human beings. Diphtheria is communicated from the matter in the throat of the patient; it is not communicated by any materials gathered around the outside of the house, the premises or streets; it is not reproduced outside of the body at ordinary temperatures. The disease that is sometimes reproduced outside the body is typhoid fever. But this subject is one which will be treated, probably, by the person who is to follow me on the subject of water supply, and by those who speak later.

* This diagram is printed on page 36.

† This diagram is printed on page 38.

‡ The diagram relative to scarlet fever is printed on page 39.

THE WATER SUPPLY OF STANTON.

BY N. E. BACHMAN, M. D., STANTON.

The subject assigned to me is of such importance that I do not expect to do it justice. The value of good wholesome water I will not attempt to discuss, but will leave that to the cultured gentlemen who lead and participate in the discussion of the subject.

In presenting for your consideration the water supply of Stanton, I shall depart somewhat from the usual manner of presenting that subject to conventions of this kind, by starting from an economic standpoint.

You will agree with me, the physicians will at least, that you can reach, hold and interest a man longer in talking retrenchment and economy than you can in presenting the value of health or picturing to him the animalcule and deadly germs found in his daily supply of drinking water. About the only time that you can interest him in the latter subject is when he is called upon to pay a doctor's or undertaker's bill.

Our present system of water-supply was not brought about by any particular desire for better water, but for the protection of property. Our city had been visited by a number of disastrous fires and nearly all of the business places on Main street destroyed. They were in many instances old and dilapidated buildings, but were nevertheless places of business and the people became thoroughly convinced that something must be done to prevent further destruction by fire.

An epidemic of typhoid fever or diphtheria arising from the use of polluted water would not have been nearly as effectual in arousing the people to the necessity of a system of water works as did the burning of those old buildings, which were all replaced by good substantial brick structures.

Stanton at this time was a booming lumber town, everybody seemed intent upon money making so that an occasional case of typhoid fever or an outbreak of diphtheria attracted but little attention outside of the families immediately affected by the maladies. The moneyed interest, however, demanded a water supply for the protection against fire. The enterprising citizens came promptly to the front and bonded the city for a sum sufficient to secure a good system of water works. There were a few, as a matter of course, who objected to it on the ground that the population was too small to maintain such a system and that the burden of taxation would overbalance the benefits to be derived from the same.

A word as to these objections. In the year 1885 the city was bonded for the sum of $10,000 and at once proceeded to construct a system of water works which have in every way proved a complete success. The system consists of a number of artesian wells, which furnish an abundant supply of wholesome water; two and one-half miles of mains; twenty-six fire hydrants; a substantial pump house, wherein is a pair of the most approved automatic pumps, which make it possible for one engineer to run the system without an assistant.

Our water rates are comparatively low and the works are nearly self-sustaining. They would be entirely so if in a generous moment previous city councils had not distributed watering-tanks and drinking-fountains throughout the city in such a way as to admit persons, who are so minded, to help themselves gratuitously. Two years from September next, the last

of the bonds will be paid, then the city will have ample fire protection with little or no expense attached; for the work under careful management, with the present number of water consumers should pay all running expenses.

I have given the foregoing short history to show that it pays to have a good system of water works even in a small city; especially is this true where the ordinary wells are located, as they usually are, in the vicinity of vaults and cesspools.

Previous to the introduction of our present system of water supply, we would have an occasional case of typhoid fever and quite frequently an outbreak of diphtheria. I think I can safely say that there has not been a single case of typhoid fever occurring in a family who use the city water, since the works have been in operation and the last epidemic of diphtheria, which was a malignant one, occurred the year before they were completed.

Therefore I contend that they have paid a large dividend upon the money invested, not only by promptly subduing every fire that has occurred within their reach but in supplying us with an abundance of good water, which has made the city of Stanton noted for its freedom from infectious diseases.

With reference to the quality of the water I will first give the contents of a letter from Prof. Kedzie containing an analyses of two samples of water sent him from separate wells. No. 1 was taken from a flowing well where the works are located and No. 2 was taken from a well of the same kind located at a grist mill about twenty-five rods to the north.

The lettter reads as follows:

Lansing, Mich., Sept. 1, 1885.

Dr. Bachman:

DEAR DOCTOR:—The two specimens of water from Stanton have been analyzed and give the following results expressed in grains to the Imperial Gallon (ten pounds):

	No. 1.	No. 2.
Total grains of solids to Imp. Gal.	20.72	19.53
Volatile at red-heat (Organic)	2.66	2.80
Fixed mineral residue	18.06	16.73
The mineral matter consists of:		
Carbonate of Lime ($Ca\ Co_3$)	11.90	11.69
Sulphate of Lime ($Ca\ So_4$)	.07	.07
Carbonate of Magnesia ($Mg\ Co_3$)	5.60	4.20
Common Salt ($Na\ Cl$)	.14	.14
Silica ($Si\ O_2$)	.35	.63
Oxide of Iron	Traces.	Traces.
Total grains of solids	18.06	16.73

The volatile matter consists mostly of organized Carbon and contains no organic Nitrogen (yielding Albumenoid Ammonia). It contains a slight trace of free Ammonia, or one part in 100,000,000 of water. It contains traces of Nitrates but no Nitrites.

In a sanitary view these waters are good with the exception that they are both hard. In chemical composition they are so near alike that it would seem they came from the same origin.

Trusting the analysis will be satisfactory and congratulating the people of Stanton on having so good a water supply,

I remain yours faithfully,

R. C. KEDZIE.

I regret the necessity of stating that we are not using just the water that Prof. Kedzie analyzed. I will undertake to explain why we are not. Before determining where the works should be located we ascertained through a series of test wells that there are two veins of water underneath the city. They are separated by a stratum of blue clay, varying in thickness from twenty to fifty feet, and apparently have no communication with each other. The upper vein of water is found just above the clay in a bed of sand and gravel and supplies the various open wells in the city. It is found at a depth of from fifteen to fifty feet. When the earth is reasonably moist these wells furnish an abundance of water but when very dry or during a drouth they become low and in some instances dry, showing that their supply is dependent largely upon surface water. This vein of water finds its way to the surface just south of the city, through numerous springs, some of them being what are known as mound springs. The amount of water coming from these springs is dependent upon the same conditions as that governing the wells, although they rarely if ever go dry.

The first test well was driven on the north side of Main street on somewhat low but perfectly dry ground. At a depth of about twenty-five feet the vein of water already mentioned was encountered and then the blue clay. The clay at this point was found to be forty feet thick, entirely free from sand or gravel, smooth and remarkably free from grit.

When the pipe passed through the clay the sand pump brought up clean smooth pebbles together with white sand and a flow of clear water came to the surface forming an artesian well, which the water from the first well would not do. Later investigation showed that when a pipe was driven to the second or lower vein the water would invariably rise to a higher level than would that of the first vein.

Being a member of the water commissioners at that time, I was in favor of locating the works on the ground where the first test well was driven. I also favored sinking a large well or reservoir making it impervious to the water from the surface or the first vein. My plan was to fill it entirely from the lower vein by means of a sufficient number of pipes driven through the clay, but a majority of the commissioners thought otherwise and the works were located upon the present site.

The clay at this point was within twelve feet of the surface and was found to be twenty-one feet thick. A six inch pipe was driven through it and an immense flow of water followed. The pipe was then plugged and an attempt was made to sink a concrete reservoir around it shutting out all water except that flowing through the pipe. In consequence of the great amount of water above the clay, in the first vein, together with a quantity of quicksand and rocks the project was abandoned. A large bottomless wooden tank was built and sunk around the pipe so that it receives water from both veins. Later a large stone reservoir was built by the side of the tank, into which the water from above and below the clay stratum is allowed to enter.

The water sent Prof. Kedzie was taken directly from flowing wells and hence from underneath the clay formation. In his analysis he says, "only traces of iron are found," but the water we are using is quite strongly impregnated with iron. This is easily accounted for. While excavating for the tanks large chunks of quartz rock were found, filled and apparently cemented together with iron pyrites, which would crumble when exposed to the atmosphere and the pyrites would become blackened. Other rocks

were found that contained carbonate of iron. These rocks are found in abundance all about us and are especially numerous around the edges of swamps where mound springs are found.

Our city is nearly surrounded by springs that differ greatly in their mineral properties. Some contain large quantities of lime, others of iron, and others sulphur and magnesia sufficient to be decidedly laxative in effect. I make mention of these springs anticipating that a knowledge of their existence may add somewhat to the discussion of our water supply.

The points that I hope to see especially discussed and which I apprehend will be important to the management of our water system in the future are as follows:

First, Our water mains are wood instead of iron. They are what is known as the "Wycoff wood pipe." We frequently hear comments upon them, to the effect that they are short lived and will soon have to be replaced with iron. One of the arguments in favor of the wood as against the iron, was that the iron pipes, connected with the pumps in the wells about the city, soon become perforated, which necesitates a frequent removal of them.

The wood pipes have now been in use nearly eight years and it has never been necessary to remove but one length. That was done last summer, as a small defect was found in a joint. The pipe was found to be perfectly clean and sound inside; the coal tar on the outside undisturbed and apparently in as good condition as when first placed. Did we err in using wood pipe?

Second, Are we running any risk of using unwholesome or polluted water, by allowing the water from the upper or first vein to enter the tanks?

Third, Is it important that we should have an analysis of the water that we are now using?

Fourth, Is the use of water from the open wells in the city detrimental to public health?

DISCUSSION.

Mason W. Gray, who was to lead the discussion on this subject, being absent, Mr. Wells was called upon.

Mr. Wells, Lansing: It is so late that I do not think it is worth while for any attempt to have a thorough discussion of this paper tonight. I have been very much interested in it, especially as I have been looking over the ground, and I want to congratulate the city of Stanton on having a good water supply; you might go through the entire State I believe and I do not think you will find any city of the size of Stanton that has a water-supply as good. So far as your well is concerned I do not see any thing objectionable in the water, and on analysis today I believe it would be found to be just as healthful as when Dr. Kedzie analyzed it. It may show more of iron and may be more of other ingredients in solution, these are not necessarily injurious; what is injurious is the germs or organisms that produce disease. If they once get into your water it is unfit to use, and unless they do get into your water supply it is healthful.

I do think you were a little unfortunate in locating your water supply where you did, in the lowest point, I think, of this neighborhood. If you had located it higher so that it would not receive the drainage from the

surrounding country I think it would have been safer water. Now, in case of an outbreak of typhoid fever the waste and drainage naturally leaks through in that direction and may reach your water-supply. If it does that, it is very likely to impregnate your water with these germs of disease. Typhoid fever is about the only disease you have to fear from that source.

What you need now to reinforce your water supply, to make it healthy, is just one thing, and that is sewerage. With that, and doing away with your vaults, you do away with the chief danger that there is of the contamination of your water. The city of Stanton should not hesitate at any expense for a system of sewerage at the earliest possible moment. Topographically the country is well adapted to it; you can have it at comparatively small expense, and I hope to hear within one year's time that you have it.

Dr. Baker, Lansing:—It is rather late I think to attempt it, but I will briefly give my own views with reference to the questions asked by Dr. Bachman, in the closing portion of his paper:

First, "Did we err in using the wooden pipe?" I think I would shirk answering that, but I would recommend that the next time you use iron pipe. I learn that the result has been no typhoid fever among the persons using that water, and that the pipes are now sound; that seems to me to be very good indeed, and yet I think on general principles that the iron pipe is better than the wooden pipe to convey drinking water.

The next question, I think, is the one of allowing the use of the upper stratum of water. Although no typhoid fever has been traced to that water, and may not be for several years to come, I think it is dangerous to continue using the upper stratum of water; bearing upon this subject, there are a great many facts which if it were earlier in the evening I should present, but I will content myself now by simply giving my opinion. I am firmly convinced that there may come a time when that upper stratum of water may be dangerous; and one thought in that connection is this: Suppose typhoid fever came here, and it contaminated one well, or half a dozen wells even, the typhoid spreads then to the users of the water of the one well or half a dozen wells; suppose on the other hand typhoid fever discharges get into the closets of the Union School house here, situated as it is above and near to the water works, what happens then? The same thing, perhaps, that happened in Plymouth, Pa., where a thousand cases of typhoid fever occurred at once. The same thing may happen in Stanton at any time, and you want to remember it. All at once you may have a thousand cases here if you use water that is so easily contaminated as that upper stratum of water. That is my view on the subject.

The next question is as to the use of the water from the open wells in the city. Well, perhaps I have answered that already, that, given one case of typhoid fever, the chances are that the well at those premises will be contaminated, and the disease may spread to the users of the water from that well; there is always danger in using well water in a place of this size. Before ordinary well water is used it should be boiled.

Is iron objectionable? I think not. I think iron is wholesome, I do not think that there is any objection to it from a sanitary standpoint. Of course paper mills would not want the water, but I see no objection from a sanitary standpoint.

THIRD SESSION, FRIDAY, APRIL 28, AT 10:00 A. M.

THE USE AND ABUSE OF TOBACCO.

BY LYMAN C. MOORE, STANTON.

MR. PRESIDENT, LADIES AND GENTLEMEN:—De Quincey's "Confessions of an Opium Eater" is a work always read with thrilling interest by lovers of choice literature, and to those who find pleasure in the grotesquely horrible its perusal affords a satisfaction that is simply indescribable. The heaven of rapturous delight therein depicted as resulting from the first use of the drug opium and the hell of despair following presents a contrast so startling as to cause an involuntary shudder whenever the word opium is mentioned.

The confessions of a tobacco chewer or smoker may possibly be needed in these closing years of the nineteenth century.

The results of medical research and scientific exploration given us from time to time in the technical language of the physician or scientist often fail to impress the generality of mankind with the importance of the subject.

The use of tobacco among men is practically universal. Its effects upon the human system seem to be well understood, the verdict of the larger part of the medical profession being that its use is deleterious in the extreme. The literature of the day fairly teems with warnings and denunciations directed against the use of tobacco.

The school boy is now taught that tobacco is a deadly poison, that its use will injure him mentally, morally and physically. But watch our school boys and you will find that they take to the use of tobacco almost as readily as do the savages of Africa.

The past duration of my life is measured by half a century and for more than thirty years I have been an habitual tobacco smoker. When a small boy I was warned against its use and many a boyish resolution I made that I never, never, would become a user of tobacco in any form.

I was told that man was the only animal depraved enough in taste to use tobacco. At the age of sixteen years mere curiosity led me to make a few experiments and I ascertained that the dog, cat, cow and hog were unanimously against the use of tobacco. I finally concluded to try an experiment upon one of the sheep family. A very valuable ram had been entrusted to my care and one day while feeding him I thrust under his nose a handful of fine cut chewing tobacco and to my great surprise old Dick seized upon it as a rare morsel, chewed it with evident relish and swallowed it, then gave me a look that seemed to say "if you have any more of that article about your clothes don't be stingy with it here." My surprise was now followed by a fear that the result might be more or less disastrous but I was happily disappointed, and my tobacco-chewing sheep continued in excellent health and spirits.

I had always been told that tobacco was a deadly poison, and I had seen several small boys made "awfully" sick in their heroic efforts to learn the manly art of chewing or smoking.

I now asked myself the question, if tobacco is a deadly poison, why did it not kill the sheep or at least make it feel somewhat indisposed?

The summer following my experiment in feeding tobacco to sheep I was engaged in making hay upon a marsh infested with rattlesnakes, the kind commonly called in Michigan "the massasauga."

One day while mowing I came right on to a good sized rattlesnake which I immediately imprisoned under the heel of my scythe and called to a companion to come and help me kill it.

My companion happened to be a lover and user of the weed, and as he came up he told me to hold the snake fast while he proceeded to take a rather good sized chew of tobacco from his pocket placed it in his mouth and proceeded somewhat expeditiously to manufacture some extra strong tobacco juice which he told me he intended to spit into the snake's mouth.

I told him that the bible said that the seed of the woman should bruise the serpent's head but that it nowhere said that the seed of the woman should spit tobacco juice in the serpent's face. However he proceeded to squirt a quantity of tobacco juice into the snake's mouth from the effect of of which it soon died.

Here was another revelation which I had not looked for, and I asked myself the question if tobacco is not a poison why does it kill a poisonous snake? What I now want to know is why tobacco will not kill me in thirty years when it will exterminate a rattlesnake in less than ten minutes?

During the first two years that I used tobacco I lived out of doors continually and I am fully convinced that the use of tobacco during those two years was to me a benefit instead of an injury. At the expiration of the two years I changed my occupation from that of a cavalry soldier in active service in the field to that of a student confined to study for sixteen hours each day. I now learned that the use of tobacco was one thing and the abuse of tobacco another thing.

In order to prosecute my studies I was compelled to restrict myself in smoking and often while a student I limited myself for weeks at a time to the use of one pipe of tobacco for days and that smoked just before going to bed.

I am well aware that the abuse of tobacco is a growing evil but the evil is with us and is here to stay apparently for a long time just the same as the abuse of tea is common among tea drinkers and is also likely to long remain perhaps to the end of time.

The evils flowing from the moderate use of tobacco by adults are in my opinion not as serious as we would be led to believe by taking the opinions of those who have never used tobacco.

Sir Isaac Newton, greatest of mathematicians and philosophers was an inveterate smoker who pursued his intellectual labors until he reached the age of eighty-four years. Tennyson, the late poet laureate of England, smoked and wrote poetry until past the age of three score and ten. It is an indisputable fact that the leading men of the present generation use tobacco.

He who can use tobacco without abusing it will never be materially injured mentally, morally or physically by its use. He who cannot use tobacco without abusing it should abstain entirely.

We are better men morally, stronger physically, and brighter intellectually than were our ancestors who lived before tobacco was carried from the new world to the old. I do not say that such is the case because of tobacco, but I do say that mankind is progressing steadily along certain

lines of natural growth inherent in the race itself and I for one have little fear that its rate of progress will be perceptibly checked by the use of tobacco.

These are my individual opinions, based almost wholly upon personal experience. But how far can we trust our personal experience when science pronounces against us.

I have great respect for that class of men known as scientists, who are fearlessly searching for the truth, and who, when they find a truth, fearlessly proclaim it. Ignorance, superstition and fanaticism have ever been the enemies of scientific research.

It requires but few brains and little labor to construct a mere theory, while to demonstrate the truth requires thought and labor. Newton spent years of laborious study before he was able to demonstrate the law of gravitation, but Calvin evolved the doctrine of infant damnation apparently without effort or expenditure of time.

Today we take off our hats to him who shows us a new truth in nature, while not very long since our ancestors imprisoned, beheaded and burned those who went to nature for the truth, instead of receiving as truths the dogmas of bigots and insane fanatics.

It is the province of science to tell us how to live, how to make use of the productions of nature in maintaining our existence in a state of happiness and comfort.

If tobacco is to be thrown aside entirely as unfit to be used by rational beings, let medical science show and fully demonstrate that in no case is its use other than injurious. After such demonstration has been made we will all set ourselves resolutely at work for a genuine reform by abstaining from its use entirely.

DISCUSSION OF THE SUBJECT.

Prof. J. E. McCloskey, Stanton: One thing we have learned very appropriately from the paper is this: That the use of tobacco is all right for sheep, but death to snakes. It seems to me that the arguments for the use of tobacco are very much like the arguments of the criminal, who, when confronted by three witnesses who saw him steal the watch, says: "That is nothing, I can produce 50 witnesses that did not see me." We are confronted with the subject of the use and abuse of tobacco, at the same time we are looking for witnesses who approve of it.

I do not wish to enter into a scientific discussion of the use and abuse of tobacco, but a few things perhaps will be beneficial; some things I looked for in the paper that did not appear, hence I will give them. Dr. Richardson, who gave a great amount of study to this subject, and who is known by the medical profession the world over, says from a physiological standpoint the analysis of tobacco shows: first, a watery vapor, from which may be separated a free carbon; it is this carbon, he says, which adheres to the mucous membrane of the throat and gives rise to the disease called smoker's sore throat. It also contains ammonia, which produces the biting sensation and consequent thirst, and makes the user of tobacco drink a great deal, and tends to the use of stimulants. It also contains carbonic acid; this is shown by lime water. It also contains an oily substance called the oil of tobacco, which contains nicotine; all authorities say this is a deadly poison. And also a volatile substance which contains the odor

of tobacco smoke; also a bitter extract which smokers very frequently find who use their pipe.

This author also tells us that there is no evidence that it produces any specific organic disease, but that it does produce functional disturbances. First on the stomach, causing indigestion. On the heart, causing palpitation of the heart. On the senses, on the brain, on the nerves, on the mucous membranes, on the bronchial surface of the lungs. Right here, as an evidence on these points that Dr. Richardson told us a long time ago, I would introduce something that appears in the National Temperance Advocate:

"Experiments made on seven healthy persons not addicted to smoking, conducted for some days without smoking, and then the same number of days with the use of 25 cigarettes each day, gave the following results, and the same with chewing:

"Tobacco increases the gastric juice, but diminises its acidity and so its digestive quality. Diminished acidity begets indigestion and flatulency, and is equally harmful with abnormal excess of acidity.

"The free hydrochloric acid is also diminished and its useful work is decreased.

"Tobacco injures the activity of the rennet properties of the stomach juice, and so hurts the work of this species of useful ferment.

"Thus both chewing and smoking alike interfere with the normal processes of the stomach. Hence indigestion and dyspepsia are common among tobacco users, and the frequent resort to tobacco for dyspepia is abnormal, being contrary to science, and must be deprecated.

"The logic of science denounces tobacco in the treatment of deranged stomachs, except, possibly, where there is too great acidity. In all cases where there is a wish to keep the healthy digestive organs in their normal condition and functions, both smoking and chewing must be avoided."

Also as regards the senses, there is an article entitled "The influence of tobacco on vision." When I was assigned this subject I intended to write to a number of educators in our large schools and ask them to answer a set of questions, but the time would not allow. Here is the experience of superintendents of large schools, and those who have conducted the experiments say that it is very detrimental to the young, and it is injurious to the eye. Here is something in line with that:

"In a very suggestive, interesting paper, read before the Mississippi Valley Medical Association, Francis Dowling, M. D., discusses the influence of tobacco on vision, and shows, as the result of careful investigation by himself and others, that impaired vision is one of the consequences of the tobacco habit,—of chewing, on account of the greater absorption of nicotine, even more than smoking. He cites the testimony of German writers. Dr. Dowling conducted a personal examination of about ten per cent of the employés of a Cincinnati factory employing 1,500 men, and found many of the men suffering from a gradual failure of vision, men who themselves used tobacco, either chewing or smoking, while with one exception, the women employés of the same factory who were examined by him gave no evidence of tobacco poisoning as manifested by troubles of vision. Tobacco poison is a menace to continued good vision. The results of Dr. Dowling's investigation admonish all tobacco users, old and young to discontinue the evil habit."

Here is also an article on tobacco, cholera and contagious diseases, but

I will omit that. If these lessons are heeded they will lead to right living and longevity. The use of tobacco, all agree, tends to neither. The same author whom I have quoted says in his article on the use and abuse of tobacco that in the young it causes impairment of growth, premature manhood, and physical degeneration and degredation. These accounts of a few experiments are given to show that it is considered deleterious to health, and that its use should be discontinued.

There is another side to the question; it should be considered from the standpoint of society. We know that the school must pay some respect to society, our schools are conducted very differently than they were fifty years ago. Formerly about the only requirement of the school, of education, was to be able to read the Bible and understand the laws of the land, be able to read them. It is different now, and the school that is a success must fit students for society; so I say we must look at it from that standpoint, and I think that everyone here will agree with me that it is not becoming and is not a fit habit for society. The writer of the paper said that it has been with us for some time, and he supposes that it will stay. It has gained its foothold here but has gained it not without a struggle. Good men and women from the time it was adopted have been fighting this evil habit. Both the church and the school and all leaders of society have taken part against the use of tobacco.

Perhaps it would be interesting to know what King James the first, of England, said upon the subject. He says: "The use of tobacco is loathsome to the eye; hateful to the nose; harmful to the brain; dangerous to the senses, and in the stinking fumes thereof nearest resembles the dark stygian smoke of the bottomless pit."

We hear the argument that there is a great deal of property invested in the manufacture of it. That may be true. Also that while it is dangerous and detrimental to the young, in the middle aged and old its effects are not so noticeable. Also we notice from the paper that where it is used with moderation its effects are not dangerous, or words to that effect; but you can find that, with a few exceptions, the medical profession, and the writers on the subject are on that point now agreed that it is not of any use. It is not a food, takes no part in nutrition only as Dr. Richardson says that where sufficient nourishment cannot be received then sometimes the use of tobacco will keep the organs in a healthy condition, but it is a very severe case when nutriment cannot be received.

We know that there is a great deal of money invested in the manufacture of tobacco and it is quite an industry, so much so that I give these statistics: In the year 1880 the gross amount of revenues collected from the tobacco manufacture in the Kingdom of Great Britain was fifty-three million dollars.

There is another point to this, and it may have been brought out last night, it would have been in line with what was said in regard to contagious diseases. There may be a number here, perhaps all of you, have been in factories where cigars are manufactured. I have been in some, and I would just like to tell you what I saw there. Now, I do not believe that all factories are the same, but I certainly know that those that I visited were. The manufacture of cigars, or what is known as the hand-made cigars, there the employés stood in stalls, so to speak, tables in front of them and scattered around on these tables was the tobacco leaf; as they stood there at work the tobacco leaf would sometimes drop on the floor about them, and as the employés are invariably users of tobacco you can

imagine what the condition of the floor is for they have no cuspidors; I have never yet been able to find a cuspidor in a cigar factory. I have frequently seen the maker of cigars take tobacco from the floor, and mix it up again with the tobacco on the table and roll it up in the cigars. And it is frequently the case that he takes this tobacco, then moistens the wrapper in his mouth and rolls it carefully around the cigar, and again dips it in the mouth and lays it away. I have seen all of this, I would not say that it is carried on in all of the cigar manufactories, but in a good many of them it is.

What were we told last night about contagious diseases? It is not necessary for me to say anything further upon that line.

I had rather have the influence and the opinion of the ladies of the house, and the ladies of the world, upon this subject than all the scientific arguments that can be produced for it.

I thank you all very kindly for you attention.

Mrs. H. H. Hinds, Stanton: Common sense, as well as observation, teaches us that constitutions physically good are so weakened by the use of tobacco that when disease comes upon them they cannot battle with it. Physicians I think will bear me out in the statement that a constitution so stimulated cannot respond to medical treatment, and oftentimes they, for that reason, succumb to disease.

In regard to the sheep that chewed tobacco after Mr. Moore gave it to him, I would say that of all domestic animals I think the sheep has the least sense; but I will say there is a good use of tobacco for the sheep, and that is, using it as a solution to dip the sheep in to kill the ticks.

As far as killing the snake at the first application, and not killing Mr. Moore in 30 years use, I cannot explain, except it might be because of a slight constitutional difference, and it was the first trial of the snake, while Mr. Moore became used to it by degrees.

Rev. Charles Nease, Stanton: This subject is an interesting one,—has been to me all my life. While there is now and then a man who lives to a great age and uses tobacco, so, too, we hear there is now and then one who lives to quite an age and uses strong drink, yet no one denies but what alcohol is a poison. There is only one answer that I know of that could be given to this question of a man living for a long time and using the weed, and that is this: With beginning he slowly accustoms himself to the poison until he can endure a great deal of it, and though he be perfectly saturated with it he lives from year to year. A man can use arsenic in the same way and become accustomed to it; he can use opium until he becomes accustomed to it; so other poisons may be used by becoming accustomed to the use of them.

As to the effect upon children, our brother has made an acknowledgment himself, when he said he found he could not use it in studying as he could when working out of doors. My observation when teaching was this: that the boys who used tobacco could not compete with those who did not. I remember on several occasions boys who failed, utterly failed, in their classes who were smokers, while the others went on. I particularly remember one boy who carried his pipe and smoked it until he came to the school ground, and then hid it and afterwards carried it away smoking. That boy could not do anything in the school; he seemed to study as hard as the others, but he had no capacity to learn, and there was no reason that I could find except that one thing, his use of tobacco.

Calls for T. H. Pierson.

Mr. Pierson: I have nothing to say in this discussion. I thank you very much for the opportunity.

Prof. Delos Fall, Albion: Dr. Baker wrote to me several times about the program of the convention here at Stanton; he asked me if I would take part in the discussion of the subject of tobacco. I said that there was one subject I did not want to be on, and that was this one.

I said it in a spirit of cowardice, that kind of cowardice is felt not only by myself but others, it has been displayed in this convention. It is because this is such a wide-spread evil, that so many men use it that there is very little use in trying to stay the tide, or stay any of the sentiment in favor of its use. There was a time when that same strong universal sentiment was true in the use of alcoholic liquors; when the clergy used it, when lawyers used it, men in all professions and good men everywhere used alcoholic liquors. It was so widespread that I have no doubt the people were discouraged in trying to make sentiment against it, but sentiment has grown and the common use of alcohol has almost entirely disappeared. We say now that appetite,—that the man who does use it is a poor pitiful victim of an appetite that he cannot control. Let us all take courage, the time is coming when this loathesome, filthy, ungentlemany habit will be done away with, and men will no more take the responsibility of using it, or advocating the use of tobacco, than any man would this moment step on this platform and so advocate the use of alcoholic liquors I do not believe a man would say he is able to do his work better because he has the ability to do his work every day while using it, but such should be the case when a man will stand up and take the responsibility of advocating the use of tobacco.

I will relate an experiment I have made myself. I took a common five cent cigar, treated it according to the method of the laboratory and isolated the poisonous nicotine from it, so that I saw it, handled it, observed it, studied it. I took a single drop of that poisonous material and put it on the tongue of a healthy cat, and the cat went into convulsions, very sudden and very severe convulsions; and I allowed it to suffer in that way for a moment, I do not know just how long but some length of time to me, until finally out of pity for its suffering I put it to death. I have no doubt but that it would have died very soon from the effects of the poison. So I am inclined to think that it was a deadly poison.

Now, why is not the man poisoned instantly who smokes a five cent cigar? The fact that he is not hinges upon one quality of nicotine; that is, it is a volatile organic substance. By volatile, you understand, I mean to change from the solid to the gaseous state. It is volatile readily and thoroughly at the temperature of the burning pipe or cigar, and that fact I have no doubt saves the life of the user of the weed when he smokes a pipe or cigar.

Just one more suggestion. I am sorry that when we call up the life and character and works of the poet laureate of England that we have, in the same breath, to say that during all of his life he contaminated his body, that he contaminated the air, that he made it loathsome and uncomfortable for his near friends to come into his presence. I am sorry we have to say that. Just by way of contrast sit down, if you please, in the atmosphere of tobacco, in the foul breath of the user of tobacco, sit down in that atmosphere and read one of Mr. Tennyson's beautiful, heart-stirring poems, and see if you like the contrast.

DISPOSAL OF WASTE AND EXCRETA IN STANTON.

BY ALLEN L. COREY, M. D., STANTON.

MR. PRESIDENT, LADIES AND GENTLEMEN:—The subject which was assigned to me is one of very grave importance, especially in its sanitary relations; it is the disposal of waste and excreta. This will include all substances subject to decomposition, in whatever location we find them, either in city or country, they are all subject to the same laws. It's very name suggests death and decay which marks its everyday course, and even the thought of death is repulsive to the most of us.

The occupation of the scavenger, although of obvious necessity in a community like this, is by many people considered as a calling but very little below that of the man who adjusts the noose to the throat of the criminal, but there are many of our animals who show distinct traces of the scavenger instinct and keep both their bodies and homes in a very fair sanitary condition, by an instinctive observance of some of the most important principles and laws of sanitation, such as that of the dry-earth system. This system of disinfection has been employed and carried into practice by animals, and by the human race since the time Moses first viewed the land of promise.

The decomposition of organic matter is a process which is going on at all times and has been since man was created and placed in the first garden and our ancient mother partook of the forbidden fruit which adorned the tree of life and knowledge. For God said that in the day thou eateth thereof thou shalt surely die. The various forms of life, both organic and vegetable, which go to make up our universe, are meeting with certain everyday changes which we call decomposition or death, for they are synonymous terms. Every tender blade of grass and every other living thing are constantly passing this change which we call death. The seeds of corruption are already sown and we are only waiting the harvest time, for every living being must sooner or later obey the mandate, dust thou art and unto dust thou shalt return. Every shriek of the tempest is a wail of woe for the death of some monarch of the forest or a king among beasts. Every rustle of the leaf or ripple of the brook is a requiem sung to the death of a million flowers or humming insects. Every moment countless myriads of inhabitants of the earth, air and water fall victims to time, the great destroyer.

The whole world is one vast charnel house, the soil we tread is strewn with corpses. The air we breathe and the water we drink is often found teeming with the dead remains of organic life. Beings who have accomplished their work and have given place to a new generation, who in turn shall meet the same fate as its predecessor.

Science reveals with unmistakable clearness that every death is accompanied by danger to the living as well as misfortune to the victim. Chemistry tells us that when the body of an animal or plant undergoes decomposition, that certain gases and other products of a noxious character spring into existence which have certain deleterious properties, which, when disseminated, produce certain kinds of contagious diseases, such as typhoid fever, diphtheria, etc. The microscope has detected myriads of these so-called specks or germs which are found present in all

this class of cases. Noxious gases and disease germs are usually associated or found together.

Now, as time is always precious I ask for a few moments in which to look over our back yards; we pass around the house and the first thing perhaps that attracts our notice is the barn which stands about fifty feet from the house. In this barn is kept one or two horses, a cow and perhaps a few fowls. At the left of the barn stands a pig pen with its occupants, four or five in number, and just at the right of the barn stands the closet and these three great sources of evil are all in less than fifty feet of the well, where the family get their daily supply of water. Now this well is an open well, the water being drawn with a windlass and the well curbed up to within a few feet of the top with pine curbing. The soil is of a sandy loam which leaches very readily. I was called to such a place last fall to see a sick boy. I was told before going out that the child had inflammation of the lungs and was very sick. I ascertained furthermore that the child had been sick for about two days. I reached the premises which I have described above and was told before I reached the house that the little boy had died. I then went into the house and what did I find? I found that a bright and beautiful baby boy had just been laid out, and looking around I discovered that three or four other children around the house had, some of them, cloths upon their necks and some had slight coughs, and I soon beheld the cause. There was death in that back yard; the remaining children all had diphtheria. The child had died from diphtheria, and before we got through with this family another boy had to succumb to this all dreaded disease.

Now, the question resolves itself, what shall we do with the waste and excreta that collect in and about our houses? I believe that fire is the greatest disinfectant, and next to that the light of the sun, and then comes our chemicals which we have quite a goodly number of, which are well known to the most of you. Then dry earth is a good disinfectant. Now, I claim that our water closets should be constructed on the plan of dry earth, and should be cleaned and drawn away by the scavenger as often as once in two or three weeks, and all other material which can be burned should be purified that way. This includes refuse from the table, such as meat rinds, bones and potato peels, or any thing else which would have a tendency to invite flies. The chips should all be raked and burned; then go into the cellar and see what we find. Well, perhaps the first thing that will meet your eye will be a barrel of soap grease, waiting for some suitable time when it can be made up into soap, and just across the cellar is a small pile of rotten apples and a few potatoes, some remnant of cabbage, all in a state of decomposition. This mess should all be taken out and either burned or drawn into the country one-half mile away from any human habitation, and there deposited.

There is one thing more I wish to speak about, and that is the slops. What shall we do with them? Shall we place them in a cess-pool? No; take them and scatter them over the garden, where the sunlight will get to them, and they will make a very good fertilizer.

Prof. Delos Fall, Albion: Mr. Chairman, I suggest that we have the other paper read (Shall Stanton Have Sewerage). The two papers are so nearly alike, they treat really upon the same subject, and let the general discussion come after the reading of the next paper.

Chairman: A very happy suggestion.

SHALL STANTON HAVE SEWERAGE?

BY JOHN W. S. PIERSON, STANTON.

INTRODUCTION.

Some years ago a gentleman living in the south of England, being a landed proprietor having numerous tenants, decided to improve their condition, and being a man of action, at once set himself at the work. With the assistance of his daughter and other members of his family, a thorough study was made of their condition and possibilities.

In order to accomplish certain results it was found advisable to bring the tenants together in a village, and accordingly one was laid out; and while not unmindful of their moral, intellectual and spiritual welfare, it was deemed of vital importance to provide for a complete system of drainage and sewerage. Thus the foundation of good health and future development was assured to all in the little village. Hence, happiness and progress kept pace.

With this object lesson before us, I give you the paper I have prepared for this Convention.

In dealing with a question so vital, in which the safety and happiness of human lives are concerned, we are confronted with real conditions that not only deserve, but *demand*, our earnest thought and concerted action.

After carefully considering all the bearings of this important subject I find no middle ground; hence I have no reason for uncertainty or hesitation in answering the question, "Should Stanton Have Sewerage?" otherwise than with a profound Yes.

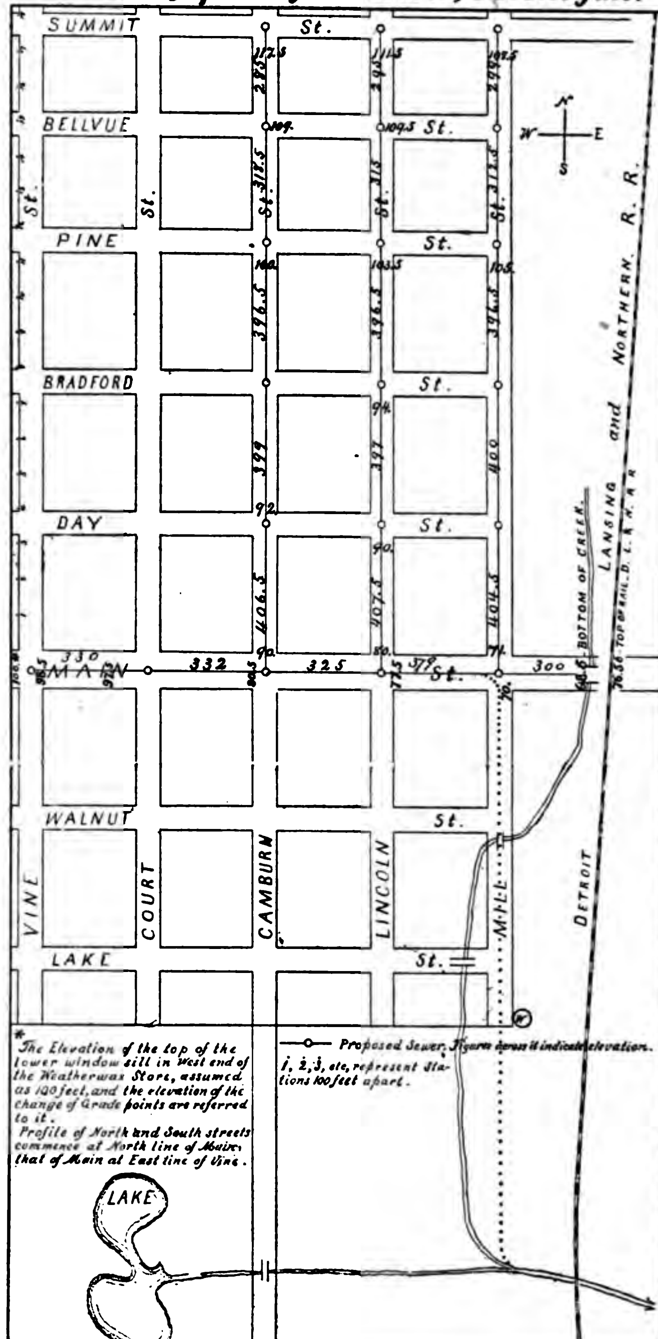
May we not all, as residents and taxpayers of the city, with one accord congratulate ourselves that the holding of this Sanitary Convention here is most opportune as a means of arousing us to our need and duty? Let us feel the full force of our obligations in this matter, not only to ourselves, but to those that will come after us.

This subject of the sewerage of towns and small cities, it is obvious, is attracting more attention each year, especially since the introduction of the Separate System of Sewerage. The modern town or city of the present day has first a complete system of sewerage regarded as the most important of all municipal improvements, and in consequence does not wait to be overtaken by some disease, which, despite of other brilliant enterprises, must run its course and force the long deferred plans for sewerage into definite shape. In other words, we are disinclined to hide our enterprises under a bushel, much less are we inclined to bury an enterprise in the ground.

Arriving at our own need, there cannot be any question about it, and it is not necessary for us to seek the domain of a large city to find out this need. Convincing evidences exist on every hand, neglected from year to year will bring disease and death, even amid our peculiar advantages in situation and soil. The responsibility of this problem is upon us. Shall we meet the conditions it will involve, or neglect it?

Let us now ask ourselves, what are the consequences, if any, that would result from a delay in introducing a sewerage system in our city?

Plan of part of Stanton, Michigan.



Are not our conditions exceptionally favorable? Yes, in our elevated location, purity of air and good drainage? Excellent. A majority of our inhabitants living on a good elevation. We must, however, recognize the situation of our water works located on low ground, with the drainage and flow of all waste made by a large share of our residents towards this low point. While I do not claim our water at the works is contaminated, I consider it my duty in urging the importance of a sewerage system to call your attention to this important fact as demanding our attention, as it can be avoided by the introduction of the separate system of sewerage which I regard as the best, and at less outlay than with the combined system.

As some may not understand the difference between the two systems of sewerage used, I will explain: The separate system is being used quite generally in villages and small cities, as it is constructed entirely of sewer pipe from 6 to 20 inches in diameter, according to the demands of the sewer; the smaller size, 6 inch, for the connections from residences, while the larger size, 20 inch, is used for the main or trunk sewer; the lateral sewers from 10 to 12 inches.

In this system the surface water is not taken, which is not considered necessary except in our large cities. It will be seen at once that the expense of the separate system, in comparison with the combined, is small; as the combined, built of brick and cement in egg shape to receive an unlimited supply of surface water, in addition to the waste, is a very expensive system and cannot be reached except by the large cities, where absolutely required.

I am impressed with the fact that a large share of our citizens will favor a sewerage system, and the question now arises: How can a system of sewerage be provided sufficient for our needs at the present time without involving too great an outlay? Until the filling in process commences, or outside of the central portions are more compactly built over, we do not require in my judgment an extensive system of sewers.

Desiring to present to those interested in this subject, and for the benefit of this convention, I have had levels and measurements taken on Main street, also on Camburn, Lincoln and Mill streets, being three of our principal resident streets. The profiles of these streets with all the measurements taken are before you, as is also a plan in blue print of a portion of the city, indicating the lake and its outlet creek with the branch creek from the north joining it below water works. Without a profile before us or any map, it is evident to many of our citizens, and even strangers have observed that we have naturally superior advantages for a sewerage system. With these advantages at command, let us review some of them.

On Main street, where the trunk sewer should be, we have a fall of 30 feet from Vine street to bottom of creek below water works. Upon the resident streets, for lateral sewers, we have ample falls to Main street, ranging from eight to 17 feet in a distance of 1,709 feet.

The objection may be raised that we have no river or large stream to sewer into, which is true, but the resources of the creek shown on the plan are considered ample for the system proposed.

In connection with the survey made I wish to say right here that it is of the utmost importance in designing even a limited system of sewerage, to have at the same time a complete system with maps, drawings, specifications and estimate of the entire city, so that whatever portion of the sewers may be built now, the future extensions will connect with them and not

sacrifice any of the first work. Some of us know from our own experiences that starting right with a definite plan to follow is really necessary to successfully accomplish any work; especially is this true of any system of public works.

A complete set of plans with all the elevations as mentioned, and estimates of any portion we may intend to build in the future, and whatever may be necessary to prepare the work for contractors to bid upon, I have ascertained will cost $400. An expenditure of this amount I regard as a wise outlay in order to avoid trouble in the future, no matter what system of sewerage may be decided upon.

It seems to me that a large and well constructed trunk sewer down the center of Main and South Mill streets, past the water works, and then curving into the iron pipe culvert under the railroad, or an independent outlet into the creek. Also, that lateral sewers leading into main sewer, be constructed on Camburn, Lincoln and Mill streets, would be expedient at the present time.

I have not attempted, nor considered it advisable, to make any detailed estimate of the cost of a system, as this matter will devolve upon the common council, or a commission appointed by them, for the purpose of constructing a sewerage system.

In 1883 a twenty-inch sewer was constructed on the north side of Main street from Camburn avenue to Mill street, discharging into the basin of the creek below. This sewer was paid for by the property owners on Main street, except where it crossed the lateral streets, the city met the expense. This sewer is of great service in draining the business lots adjacent to it; also some private houses have connected with it for drain outlet. We have no catch basins connected with this sewer, which would be an important addition to its service in relieving the north side of Main street of surface water.

In concluding this paper, let us recognize the manifold benefits derived from a sewerage system. Even with an increase of taxes, we should estimate the improved sanitary conditions resulting from the outlay, which will augment our happiness if not our prosperity. May our chief desire and purpose be to improve the condition of our fellow men from a standpoint of health. Believing that anything that should be done, can be done, and by availing ourselves of the opportunities at our command, we are carrying out the *designs of God.*

DISCUSSION OF THE SUBJECT.

Prof. Fall, Albion—As I have suggested, it seems to me that these two papers came together, and we could not isolate one from the other. Necessarily a discussion of one would involve the other. It really is divided into two parts, though, because, in order that we shall feel the necessity of a system of sewers we may first keenly appreciate the danger of perpetuating the present condition of affairs. The present condition of affairs which has a close relation to the system of sewers is this picture which Dr. Corey has given us this morning of the back yards and premises he has visited. I believe this is a picture which is true, and which I shall for just a few moments try to emphasize. It is a dark picture, built upon our method of living and working in the days of barbarism, one that has come down to us from the ages gone by; and while we have been energetic in putting away a great many objectionable features of other kinds we have not in

this matter done what we ought. We have not done what should have been done. We have simply perpetuated the old hole in the ground, and into it we have been placing our waste and excreta for all time.

I do not know how old it is, but if this city is forty years of age the amount of waste produced by the people living here has been poured into the ground to soak through and make its way slowly or more rapidly according to the nature of the soil, so that if we could get a proper picture of the soil under the city of Stanton, I have no doubt it would be one reeking with filth. The writer of the paper has correctly said that public sentiment is easily aroused in a place like this when it is for something to adorn the city, something above ground, something which can be seen in all its art and beauty and attractiveness, an ornament to the city. You can very easily gain sentiment in a city like this, a sentiment that will crystalize into a high-school building. (I am not in any way, I do not mean to in any way reflect upon your high-school building, for I do not know anything about it), and if you will watch carefully the growth of that sentiment, that interest, you will see that the thought which is intensified in the minds of our public men is how the exterior of the building is to look. You school people love to look at it in the interior yourselves, but your public spirited men will say, how is that going to look on the outside; how are the doors going to look; how are the cornices going to look; how are the windows going to look: how are the entrances, archways, etc., going to look? So that when a man comes into this town, a man will say, what a beautiful public building we have! So with a church or any public building of that nature. Now for the proposition to plant a large sum of the city's money for sewers, for that which shall be buried under the ground and out of sight, which does not on the surface of things adorn the city, is one that will have to be fortified with many arguments and pictures of things as has been done today.

The ordinary village lot, four by six or four by eight rods, contains, as the paper stated, the home, barn, cess-pool or privy vault. The worst feature of this arrangement upon our little square of land we call our own and take so much pride in, is the privy vault containing the large quantity of excreta. Now that human organic excreta is poison is a fact that has been of slow growth, but is slowly gaining credence among common people, and will presently result in the better arrangements for the disposal of this poisonous substance. I want to call your attention to this fact, that the vault which is constructed is not so deep as another excavation which you make in the same soil, and that is, the well.

I had a discussion with a farmer the other day about the probability of his well becoming contaminated from the barn, cess-pool, etc., about the house. He pointed to the fact that the well was on the side hill at a higher point than the sources of the contamination; he says it cannot be that the leachings from the barnyard and privy vault can run uphill to the well. I told him that, looked at simply from the surface, really the drain from the cess-pool and privy vault was down from the well, but that he must bear in mind this fact, that the well was deeper than these other places. Suppose the well was thirty feet deep and the privy vault was ten feet deep; then the bottom of the well is twenty feet lower than the privy vault; the course then is downward from one to the other. No matter what the surface arrangements are, the well is down here and the privy vault is above it. It is just as certain that the material will leach through the soil to the bottom of the well. Fifty feet, the paper has sug-

gested as the distance between these places. What will fifty feet of soil do towards cleansing or purifying this material, towards making it pure and sweet and wholesome, and that no material should come from the privy vault that would not be thus cleansed by the time it gets to the well? I asked him if he would like to build a large funnel fifty feet deep and let the point of the funnel be run into the well, let it be above the well, and put it full of nice pure soil, and then have the other end terminate in the privy vault. I asked him if he would like to have the material of this waste and garbage every day for all the weeks and years and scores of years, poured into that funnel on top with the thought that there was fifty feet of soil only in it. Why, no, he would not want any such thing as that, he would be afraid that the material should somehow—well, he had great faith in the purifying properties of the soil, but still he would feel fearful that some of the matter would get into the well. I said you have not got that sort of an arrangement, but you have what amounts to the same thing. You have deliberately poured into that place over there all this material for all these years and it is just as certain to come into your well.

I have had considerable experience in analyzing well water. I have gone thoroughly over my own city. I have analyzed water from scores of wells in different parts of the city, in order to determine the quality of the water, and at a time to enforce upon our citizens the necessity for water works. I may say it was done for the preparation of a paper for a sanitary convention similar to this, held in our city. The objective point was the making of a sentiment that should crystalize into water works. I did not find a well that did not show fearful contamination, so that I came to believe that what I found in analyzing those wells to be a fact, is true of all wells in all communities that have been settled for 30 or 40 years. And I stand here this morning, Mr. Chairman, to affirm with great confidence that the well water in the wells in Stanton is contaminated, badly contaminated. In this city you have a water supply, you have a source of water, which is at one place and you will not therefore be obliged to scatter your attempts at the preservation of the purity of this water over the whole city, but you can concentrate your efforts and keep that water supply pure. Now, that is the way, that is the burden, the responsibility of the city of Stanton is to maintain that water supply down there at the water works in a pure condition. Let me make some suggestions:

I am not certain about the conditions of your water and of your water supply, but I know that it is true always that we have around here this drift deposit which geologists tell about; first gravel and the loamy earth above it through which water easily makes its way; below that, inevitably in Michigan, we find hardpan of one kind or another, it may be hard clay soil, it may be more or less compact sandstone; at any rate there is a layer that is impervious to water, so the water and liquid material from the surface of the ground leaches down through that soil until it reaches this impervious stratum, and flows no further. So that we may picture a lake more or less deep under the city of Stanton, the bottom of which is this first impervious layer of clay or sandstone. That holds what we call surface water or ground water; it contains more or less in solution the dissolved impurities that I have been speaking of. I should think it would be very unwise for any city to draw its public water supply from such a source. It may be that at the present time it is pure, and it may be free from disease germs, but I am afraid that the time will come, some unfortunate time, when the germs of disease will be scattered upon the soil or

in some of these places of deposit and will leach through, dissolve into the water and get into the water supply.

The way to find the water supply that is pure, protected, and in fact the best supply of water, in my way of thinking, that we can obtain in the State of Michigan, is to pierce that first impervious stratum, and draw our water from below that source, from between this stratum and another one that lies deeper, down below the first impervious stratum. We will find two impervious strata, between them we will find some water that is the purest water that is to be found. If the water supply of Stanton is to be drawn from such a source, and if the point at which the upper stratum is pierced is properly guarded, that is where the pipe goes through, so that there can be no possible connection between this ground water and the water beneath, then you have a source of perpetually pure water supply for a long time to come. What is the method of guarding against all these dangers I have spoken of?

It seems to me that there can be but one answer, and that is stop polluting the soil, as we have done, with our waste and excreta; carry this waste and excreta off from the area that is covered by the city, by a system of sewers, and deposit it in a stream where it will be carried away, and be rendered free from harm to the citizens of Stanton.

Just one other point: That is with reference to this suggested use of a dry-earth closet.

I have practiced that myself for a good while, and I speak of it because I have the standpoint of experience from which to speak. By the mixing of human excreta with dry earth, as we ordinarily use, but as I prefer to use myself, coal ashes, it renders the excreta dry, inodorous, and brings to rapid decomposition all the organic matter, and brings it to a condition that is inoffensive, and which can at stated intervals be put out on the garden, and there perform its legitimate result of enriching the garden, and thus be harmless, and be devoid of all offensive odors, and which shall not be, in any sense, the home of the disease germs which bring about and propagate disease.

As to the dry-earth closet, it consists of a box or pail that is water tight that will hold this material and be provided with coal ashes, and some provision by which this pail or box can be carried out. This is a simple contrivance, and I think it is well to put one near every home in Stanton; and it will do away forever with this black blot upon our method of living, the hole in the ground for the deposit of this material.

Dr. Baker, Lansing: I was very much interested in the two papers this morning, and I agree with Dr. Corey and with Prof. Fall, that the dry-earth system is a very great improvement over the privy system, and it should be adopted where the other method of disposal cannot be made available, but where sewerage can be put in operation, it should be, for it seems to me that that is the ideal way. In this city at this time it seems to me to be very important that the city should establish a system of sewers, and they should have, as outlined by Mr. Pierson, a complete plan on the start, even though only a small portion of the plan be built immediately. For the reason that unless they do have a plan of sewers to be built, on the start, there will be an expense for that which will not be available later, and the expense will be multiplied over what it would be if the plan were decided upon at the start.

Mr. Pierson has here before you some diagrams. I think he has not

explained these diagrams, probably for the reason that most of you know the lay of the land here better than do those from abroad; but I have been interested in studying this plan. This is the street on which we are now, isn't it? And I notice, as has been explained by the other speakers, that nearly all of the surface drainage, and probably the drainage of the underground lake referred to by Mr. Fall, must tend in the direction of the water works.

As I understand from the paper read last night, the water supply was designed to be drawn from the deeper stratum, but the works practically does give you water not only from that deep source, but also from the upper ground-water. I think it is very important that this should be done away with. And the other blade of the scissors should be put in now; the sewers should be begun at once, and the sewage should be carried down past the water works, and out in the stream away from the city.

I wish, before closing, to refer to positive evidence on the subject of prevention of disease in the method here outlined. I have here a diagram* of the mortality from typhoid fever in Munich, a city where typhoid fever prevailed under conditions such as these are in Stanton,—they used water from wells, and they had no sewers. From 1854 to 1859 the deaths in each year were about twenty-four to the ten thousand inhabitants. (That, if I understand the population of this city, would be equal to about three persons in Stanton dying each year from typhoid fever. Typhoid fever is the disease that is spread by contaminated water supply. Three deaths per year in Stanton from typhoid fever do not seem to be very many, and yet, those three deaths from typhoid fever, a disease that is entirely preventable, should be prevented.) That was from 1854 to 1859. In 1860 they began to cement the vaults; that was a great improvement, and you will see that the decrease of deaths is very material. In 1866 they commenced to sewer the city, and you will notice that the typhoid fever decreased again. In 1874 the sewers were continued, and somewhere in here they commenced water works. Of course the subject of water supply and sewerage necessarily go together. Not all of this decrease in sickness was due to sewerage, but a part is due to an improved water supply brought from outside the city. In 1881 to 1884 the sewers were still further continued, and spring water was brought from outside the city, so that not only the use of water from wells was discontinued, but pure water was brought in, and the typhoid rate went down to one or two per ten thousand inhabitants. Since that time the typhoid has entirely disappeared from that city, except what has been carried in there. It is said to be a fact that to exhibit cases of typhoid fever to the students in medical colleges there, they must have recourse to taking those that are brought in from the outside. I take that city as an example, because the death-rate there before commencing that work was not different from what we have today in this State, in many places, and I think it is quite possible that you have had that number of typhoid deaths here, the same proportion that they had in Munich before they commenced their improvements.

It is absolutely certain that the typhoid rate has been decreased there in proportion as they have increased their sewerage, and have perfected their water supply.

I do not want to take up more of your time; it is getting near dinner time, and I will give place to some one else.

---

* This diagram is printed on page 63.


TYPHOID FEVER and SEWERS.
AV. 313 CITIES WITHOUT.
AVERAGE, 39 CITIES WITH,
MUNICH.
1854-59, NEGL'C'T.
1860-65, CEMENT VAULTS.
1866-73, PART S'W'RS.
1874-80, SEWERS CON'T'D
1881-84, SEWERS CONTINUED.

While waiting for some one else to rise, I want to emphasize one point mentioned by Mr. Pierson, that is of great importance, I think, that of adopting the separate system of sewerage. I think it would be a great mistake for this city if it should undertake to make large sewers that would take in surface water—what is known as the combined system. The size of the sewer would have to be very large to accommodate the amount of water that would come suddenly. The expense would be very much greater, and the results not so good as by the separate system. It is possible to have the sewers of the separate system too small. In Memphis, Tenn., they adopted the separate system, and the outlet of the main sewer was only fifteen to twenty inches. That was found to be inadequate. And many of the sewers in the populous districts were only six inches. I think they found that an eight inch sewer was less likely to clog, and less expense to keep in order. I think the separate system should be adopted, and no effort made to take in at the street corners water that should flow off on the surface.

Mr. J. W. S. Pierson, Stanton: Mr. Pierson then explained his maps and diagrams, including the "Plan of Part of Stanton," a copy of which, reduced in size, is printed herewith, on page 56.

Mrs. H. H. Hinds, Stanton: As you have called upon the business men of Stanton, and not for the ladies or the housekeepers, I suppose it is considered that they do not have a great deal to do with the back yards. How many men there are that pollute the back yards with garbage and slop water! I want to say that I heartily endorse the paper. I never realized before the full importance, or thought very much about it.

My curiosity was excited somewhat a few days ago when I saw the surveyor around the streets taking measurements. I made some inquiries, but I was told: "Never mind; you will know by and by what it is for." I think I know now the importance, and I heartily endorse the subject. I hope the system will be perfected, and that Stanton, in the very near future, will have a good system of sewerage, whatever the system may be.

I would like to ask Professor Fall if wood ashes serve the same purpose as coal ashes?

Prof. Fall, Albion: No, madam, they do not. Coal ashes are very serviceable for this purpose, but not wood ashes.

Mrs. Hinds, Stanton:—I think that at just such conventions as these, if our people from the rural districts, our country people, would come here they could learn a great deal; and while I do not think that Dr. Corey gave an illustration of many Stanton homes, I have seen it in the country. They do not realize the danger, they do not know why it is, and I wish this house could be filled by our friends from the country.

Mr. Charles Wicks, Stanton:—I apprehend that the failure on the part of our citizens to speak upon this matter is not a failure of the whole of the city. I, for one, realize the importance of this very strongly, and am glad a paper has been presented in such an able way; and I trust that this will not be all, but hope it will crystalize into something that will be of substantial benefit to our citizens. God has been very kind to us in the past, kinder than we have to ourselves, I think, and it would seem that it is now time that we took hold and did something for ourselves.

Adjourned to 2:30 P. M.

FOURTH SESSION, FRIDAY, AT 2:30 P. M.

DISEASES OF DOMESTIC ANIMALS WHICH ARE COMMUNICABLE TO MAN. WHAT IS THE STATE DOING ABOUT THIS CLASS OF CONTAGIOUS DISEASES?

BY MRS. H. H. HINDS, STANTON.

When the original arrangements were made, for this convention, my husband promised to produce a paper, to place in the files of your proceedings, treating upon the subject just announced. At that time he fully intended to devote the time needed for its formulation; and its final preparation would go forward in due time, so that it would be in shape to issue from his office as other official documents do.

Unfortunately, as in common with other World's Fair officials, he has either underrated the amount of duties falling to his lot, or what is worse, overrated his ability to perform. Suffice it now to say, that he has been utterly unable to find time to take this matter up with me in outlining the paper, and I, not knowing just in what line of thought he would treat the subject, have been in the exact position of the man who "takes hold of his boot tops for the purpose of lifting himself." The paper is not prepared. I am here to express his sincere regrets that circumstances over which he has not had control have prevented its preparation.

He was home over last Sunday, but this subject was not reached. He has now gone hence for the season. The commission of which he is vice-chairman is now having some sessions, somewhat upon their own motion. But by a law of the directory it will be required to hold daily sessions from the rising of next Monday's sun until it sets the last of October, not including the Fourth of July or Sundays. That this convention may not be entirely without information on the subject of what this paper should treat, I have brought along enough of its recorded history upon which you may profitably found an hour's discussion.

I have not made any special abstracts of subjects to call your attention to, but will read some extracts from the laws and reports, and as I am somewhat familiar with the origin of all copy from which the documents have been printed, I may be able to answer some questions relating thereto, should members of the convention desire to ask questions.

The following are extracts from an act to provide for the appointment of a Live Stock Sanitary Commission and a State Veterinarian, and to prescribe their powers and duties, and to prevent and suppress contagious and infectious diseases among the live stock of the State, approved June 10, 1885:—

The State live stock sanitary commission.

SECTION 1. *The People of the State of Michigan enact*, That a commission is hereby established which shall be known under the name and style of "The State Live Stock Sanitary Commission." The commission shall consist of three commissioners who are practical agriculturists and engaged in the live stock industries of the State, who shall be appointed by the Governor with the advice and consent of the Senate. One shall be appointed for the term of six years, one for the term of four years, and one for the term of two years, whose term of office shall commence on the second Tuesday of July of the year in which they are appointed and shall continue until their successors are appointed and qualified. And at each succeeding biennial session of the Legislature there shall be appointed in like manner one commissioner who shall hold his office six years, or until his successor is appointed and qualified. The Governor shall also appoint, with the advice and consent of the Senate, a competent and skilled veterinary surgeon for the State, who, at the time of such appointment, shall be a graduate in good standing of a recognized college of veterinary surgery, and who shall hold his office two years from the second Tuesday of July of the year he is appointed and until his successor is appointed and qualified. The Governor shall also appoint every two years thereafter a competent and skilled veterinarian having the qualifications above mentioned, whose term of office shall be for two years or until his successor is appointed and qualified.

To consist of three persons, practical agriculturists.

To be appointed by the Governor, etc.

Term of office.

When to be appointed.

Veterinary surgeon.

Term of office.

Duty of the commission.

SEC. 4. It shall be the duty of the commission to protect the health of the domestic animals of the State from all contagious or infectious diseases of a malignant character, and for this purpose it is hereby authorized and empowered to establish, maintain and enforce such quarantine, sanitary and other regulations as it may deem necessary.

Quarantine regulations, etc.

When in the opinion of the commission it shall be necessary to prevent the further spread of any contagious or infectious disease among the live stock of the State, to destroy animals affected with or which have been exposed to any such disease, it shall determine what animals shall be killed, and appraise the same, as hereinafter provided, and cause the same to be killed and the carcasses disposed of as in their judgment will best protect the health of domestic animals of the locality.

Penalty for violation of this act.

SEC. 15*a*. Any person who shall willfully violate, disregard or evade, or attempt to violate, disregard or evade any of the provisions of this act, or who shall willfully violate, disregard or evade any of the rules, regulations, orders or directions of the Live Stock Sanitary Commission establishing and governing quarantine shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be fined in any sum not less than ten dollars nor more than one hundred dollars, or be imprisoned in the county jail not less than ten nor more than ninety days, or both such fine and imprisonment in the discretion of the court.

Authorized to employ persons and purchase supplies, etc.

SEC. 16. The commission provided for in this act shall have power to employ at the expense of the State such persons and purchase such supplies and material as may be necessary to carry into full effect all orders by it given.

SEC. 17. The commissioners shall have power to call upon any sheriff, under-sheriff, deputy sheriff or constable to execute their orders, and such officers shall obey the orders of said commissioners, and the officers performing such duties shall receive compensation therefor as is prescribed by law for like services, and shall be paid therefor in like manner. And any officer may arrest and take before any justice of the peace of the county any person found violating any of the provisions of this act, and such officer shall immediately notify the prosecuting attorney of such arrest, and he shall prosecute the person so offending according to law.

May call upon the sheriff, etc., to execute orders.

Compensation.

May arrest.

Duty of prosecuting attorney.

Glanders is a loathsome, infectious and practically incurable disease, to which not only the horse and several other of the lower animals are susceptible, but man himself.

Experiments and observations in this country and Europe have substantially determined that cattle are not susceptible to this disease.

"Glanders is a disease which is invariably described as belonging to the equine race, and that it is transmitted from it to other animals; just what ground there is for this assertion is not made clear, though it may be accounted for by the fact that the disease has been recognized for centuries as a malignant disorder amongst horses, while it has not even been suspected amongst other animals until a comparatively recent date; indeed, it is only within the last seventy years, that the disorder has been recognized in the human family, when in 1822, it was first described by Schilling, but it is not to be supposed for a moment that this was the first invasion of the human family by the microbe of this disease; indeed, it may be regarded as an open question whether the human race first contracted it from the equine, or the equine from the human. We are told in second book of Moses (presumably written about 1,600 years before the christian era) that the ashes which he, Moses, took of the furnace and sprinkled before Pharaoh became a boil breaking forth with blains (*pustules*) upon man and beast. Now, if these blains, or pustules, were the same as we recognize in the glander-farcy pustules, why surely the human race has as much to do with the origin of the disease as the equine.

"Glanders is known under a variety of synonyms, but the only one that we are concerned in, besides farcy, is the term *Equina*, which is given to it when it invades the human race, although the term *Malleus humidus*, used by early writers, might be an appropriate one to call the complaint at the present day, not only because *malleus* has reference to evil things, and *humidus* applies to the moist discharge, but because the discoverers of the micro-organism which causes the complaint have given it the name of *bacillus mallei*. (See Fig. 10, page 27.)

"The geographical distribution of this disorder, was somewhat limited until the commercial intercourse between countries began to assume extensive proportions, and now that horses are so easily exported from one part of the world to another, we find this disease disseminated with them. It is said not to have been known in America till the close of the last century; since then, through the exposure of military campaigns, shipping horses from one part to another, etc., etc., it has become pretty generally diffused over this continent. Condemned horses from the United States army, at the close of the late civil war, are credited with having distributed the virus of glanders far and wide.

"So it becomes at once apparent from the foregoing, that glanders may be a more common disease in the human family than is generally supposed. I have known of several cases in this State where persons have died, presumably from some other disease, though the history and occupation pointed to glanders. In the northern peninsula I found seven horses in one stable affected with glanders. On asking for the man that owned them I was told that he had died about two weeks before from an attack of *inflammatory rheumatism*, and that among other things there was a running sore from one knee. If this was not a pure case of glanders in the farcy form, it looked very like. Another case was brought under my notice last fall in the northern part of the State, which possesses some interest from a pathological point of view. I examined a horse belonging to a farmer, and pronounced it a case of glanders. It happened that the man I obtained the livery from to go to the farm was an undertaker, and had attended as funeral director in the case of the farmer. On learning my opinion with regard to the horse, he described the appearance of the man, which was loathsome in the extreme, and asked me if I thought it could be glanders. Surely it was, although it had been regarded as erysipelas. The man had been attending the horse, and had a sore on the side of his nose from which the disease seemed to start."

The fact is again to be stated that glanders alone occupies more of the time and attention of this commission and the State Veterinarian, and costs the State much more, than all the other animal diseases which are brought to our notice, combined. It had long had a foot-hold in this State before the enactment of live-stock sanitary laws, and in the nature of things can readily be transplanted from one county to a distant one by simply transferring ownership of a glandered horse from one locality to another. In December, 1891, the Michigan Agricultural Experiment Station, located at the Agricultural College, issued bulletin No. 78, entitled, "Glanders and Farcy." The author of the bulletin was Prof. E. A. A. Grange who, while being in charge of the veterinary department of the college and station, is also State Veterinarian. I desire to state that during the first years of this commission it was found in thirty-six counties and animals were condemned and killed. It is a pleasant fact to state that during the past year not to exceed ten counties have had condemned animals.

"The law under which we operate provides that 'whenever the Commission shall direct the killing of any domestic animal or animals it shall be the duty of the commissioners to appraise the animal or animals condemned, and in fixing the value thereof the commissioners shall be governed by the value of said animal or animals at the date of appraisement.

"The Commission, as at present constituted, believe that a horse having glanders clearly developed has no market or selling value, is in fact worthless, and of all the horses we have thus far ordered destroyed, with four exceptions, we have awarded the nominal damage of one dollar for each case. The disposing of one of these diseased brutes is a more serious and expensive undertaking as the animal frequently has to be taken some distance from a city or village for proper burial. The ground is at times frozen deeply, the snow may be deep, or privilege of entry to woods places for burial, may be denied by the owner. These items combined, however, amount to but a small percentage of the cost to the State, thus far, in dealing with this vile disease. The great items of expense are the traveling

expenses and per diem of members of the Board and State Veterinarian in reaching these cases, scattered as they are, in various parts of the State.

"The Commission are unable, after giving the subject careful thought, to suggest a cheaper and at the same time safe and effectual plan of dealing with this disease. If the law was changed and authority placed in the hands of local officials it is very questionable if the State would save financially, and besides the local officials might not readily detect the disease from lack of experience in observing its characteristics. Their appraisement of values would probably cover a rather wide range, usually about the price of good sound horses, as is indicated by correspondence reaching the commission, reporting cases where probable value is stated. In fact a local board of health in a recent case, reported from a distant county, undertook to act for this Commission, of course without authority of law or of the Commission, and determined that an aged mule had glanders and therefore ordered its destruction and appraised and fixed its value at the sum of $135.

While questions of public health are delegated to another board by the statutes of our State, we deem it but proper to add that in the pursuit of our duty in trying to extirpate glanders from the domestic animals of our commonwealth, we every year come upon unmistakable evidence of death among the human family from this loathsome disease.

I state authoritatively when I say it has come under our supervision in more cases than one, during the last few months. A lady whom we all well knew here and was once a music teacher and pioneer of Stanton, died in a neighboring town where she had resided for the past few years, with this loathsome disease. I believe it was reported blood poison killed her, but the facts were she caught glanders from the family horse that was affected and in her efforts to save its life lost her own, possibly through ignorance of the communicability of the disease. The horse was condemned, and destroyed by the commission.

The perusal of this little law pamphlet will show that wherever a *contagious disease* of *a malignant* character appears among domestic animals whether communicable to man or not money values are in the balance.

An energetic commission with unlimited authority proceed along the line with fire brand, pole ax and rifle and stamp the disease out, as they ought, too, with no law limit as to cost of same. On the other hand, read the voluminous laws relating to *public health* that appear upon our statute books and you will find them so hedged about with conditions and lacking in the essential element of ways and means to pay costs, that they are slow of enforcement and often entirely barren of results in staying the progress of dangerously contagious diseases. I am not assuming that while the law permits this Commission to either quarantine or shoot a mule affected with glanders that by the same token the health authorities should have the authority to at once kill a man found affected with this malady but they should be vested with the authority to so quarantine the victim of this loathsome disease or destroy his environments that his innocent wife and helpless children and the stranger within his gates might not be liable to become infected with this deadly blood poison. The same rule would be applicable along the whole line of contagious diseases to which the human family is heir.

DISEASES OF CATTLE.

Actinomycosis.—Actinomycosis, or lumpy jaw, was apparently epizoötic in several townships of this State at the date of our last report, and was engaging a good deal of our attention, and causing considerable loss to cattle growers in some localities. The disease appeared in a sporadic manner, but spread, in some localities, with considerable rapidity. A series of experiments were then in progress at the Experiment Station, under the solicitation of this Commission, to learn more about the communicability of the disease. But little was learned from the experiments; in fact, it may be said that the results were negative. It may now, however, be stated, as a pleasant fact, that the disease in this State seemed to have rapidly run its course and ceased its depredations as mysteriously as it came, and it may be considered as not present now with us. While the foregoing may fairly be treated as the chapter embodying the recent history of this disease with us, we are able to herewith promulgate very important information relating to its successful treatment elsewhere. The Bureau of Animal Industry, under the direction of the Secretary of Agriculture, and in behalf of the general government, have been carrying on very extensive experiments during the last year, principally at Chicago, for its cure. The manner and mode of treatment are fully set forth in Bulletin No. 2, U. S. Department of Agriculture, Bureau of Animal Industry.

Rabies has received some attention from this commission, and in every case reported some member of the human family has been bitten, but the commission had power to act only in behalf of the domestic animals, which they did.

Contagious Pleuro-Pneumonia.—This, the most disastrous of all cattle diseases, is an exotic disease imported to this country nearly a half a century ago, and safely housed in the dairy stables on our Atlantic seaboard. It has gradually crept inward, so that, in 1886, it was found camped in the vast distillery stables of Chicago. It has finally been stamped out on this continent by persistent and energetic work of the Department of Agriculture, but not until more than a million dollars had been expended by the general government and the different States in the great undertaking.

Texas Fever.—The files and records of this commission for the year 1886 show that from the official reports of the police and health officers of Detroit to the commission, during the summer of 1885, (the year this commission was organized) that more than ten thousand dollars worth of cows perished in that city alone from Texas fever. The most of them were the property of poor people. In addition to this, losses from this peculiar disease were occurring at other cities in the State. From and including the year 1886 (the law not taking effect until late in 1885) this commission has been striving to regulate the handling of the thousands of Texas cattle slaughtered in Michigan, so as to reduce the loss of native cattle from Texas fever to the minimum, with the result that during the year 1892 not a single case of Texas fever was reported in the State. It may be inferred that the traffic in this class of contagion—carrying cattle has practically ceased, but such an impression would be far from the fact, for, during the months of July, August, September and October of this year, there were received and slaughtered at Detroit 11,401 head of Texas cattle. The general government, during the last three years, has adopted the same regulations as to branding cars and yards, and isolating Texas cattle from

natives, as was originally provided in our Michigan laws, and by the rigid inspection of all cattle at principal distributing points, and requiring transportation companies to keep these cattle in branded cars and yards, and thereby always identified, it has very materially aided this commission in carrying out its regulations in this State.

Tuberculosis.—"Undoubtedly this disease has gained a serious foothold in our State, and is causing large losses among our cattle stock. It is beyond question both infectious and contagious, particularly in the pulmonary development or consumption of the lungs. The commonly accepted theory is that it is communicable to man, not only by direct contact, but also in the partaking of the milk and meat of these diseased animals."

Years of added experience and careful observation lead us to the conclusion that the annual losses among Michigan cattle from tuberculosis is much greater than from all the other contagious diseases affecting our domestic animals and that the disease is steadily increasing. The Commission have given the subject very careful thought and consideration, and have as yet failed to find a satisfactory plan for its treatment or extermination. The scientists have furnished no prescription for its cure, and history does not abound with feasible plans for its successful stamping out in a great State. It, as yet, is one of the unsolved problems, lying all in front, and like some bridges, in our pathway, the day is not far distant when an attempt must be made to cross.

In behalf of this Commission I would say that in the pursuit of their duties as laid down in the laws under which the commission was created it has not had the advantage of following precedents established by better men who had preceded them. Its members have acted in all cases promptly and without standing upon the order of their going, waiting for neither wind nor weather, and have been both storm-bound and wrecked in pursuit of their duties, and now after eight years trial it has proved no experiment, but an essential factor for the protection of our domestic animals, and the fruits of their labors show their importance to this great commonwealth.

In conclusion I would say, I am sufficiently acquainted with my husband to know that if he were present in person, as I have no doubt he is in spirit, that he would assume that the State Board of Health, under whose auspices we have now assembled, together with the hundred or two local health officers of the State, enlarged with our medical colleges and brigade of practicing physicians scattered through every hamlet of our commonwealth, should formulate such bills, and see to it that the legislature enacts them into laws, as will treat the exposure of a human life to a dangerous and malignant communicable disease, as is now done in protecting the life of a chicken or a pig from communicable disease to which it is susceptible.

DISCUSSION OF THE SUBJECT.

Mr. Oscar Fenn, Stanton: Mr. President, ladies and gentlemen: It is not my purpose, and I did not arise to discuss this question at all; in the first place I am not a discussor; but I wish to ask a question that we may all gain some information. Mrs. Hinds has read a very nice paper, that I have been greatly interested in. I am glad to know, as I have known for years past since this commission was created, that it was doing good in the way of taking care of mules and horses with the terrible disease mentioned.

I wanted to ask Mrs. Hinds what it was about the destroying of these cattle with tuberculosis; that, I understand from the paper, is a communicable disease that afflicts both man and beast. Did I understand it properly?

Mrs. Hinds: Yes, sir.

Mr. Fenn: Now, if I understand it rightly (and if I do not I wish to be corrected) it would be, in my judgment, much more necessary that a cow with that disease should be destroyed than a mule with the other disease. Because a cow is giving milk, and perhaps it is my cow and it is giving milk right in this vicinity.

Mrs. Hinds: That is a bridge we have got to cross. It has not been provided for as yet, but it is a question that Michigan has got to take hold of. There is no adequate provision made as yet in regard to staying this disease which is steadily increasing.

Mr. Fenn: It seems to me that this is the most dangerous disease of the two.

Mrs. Hinds: I think that, if it is a communicable disease, they have all the authority, there is no limit to it.

Mr. Fenn: It is a communicable disease, and so understood. Why haven't they the power to go on and destroy? There is a great deal of this disease in the State I understand.

Mrs. Hinds: It has been stated by some that it is not a communicable disease, and in some States they have tried to effect a cure. In that case I do not know as they could quarantine, but they have the power to kill them if they are affected with any communicable disease.

Mr. Fenn: I think it stands our commission in hand as soon as they have full power to kill cattle with tuberculosis to destroy them. I have heard it stated that glanders could be cured, but there isn't any of us that sit here in these seats today that want anything to do with curing it; and it is so with tuberculosis, in my judgment. The only thing is to stamp it out.

Mrs. Hinds: (reading.) It shall be the duty of the commission of the State to protect the health of domestic animals. It is authorized and empowered to establish, maintain, and enforce such quarantine, sanitary, and other regulations as it may deem necessary.

Mr. Fenn: You cited several instances of their doing that with horses and mules with disease, but none where cattle had been destroyed or taken care of.

Mrs. Hinds: The commission cannot act unless there is a report made, and when a report is made it is a question, as I stated in my paper, that we have got to take hold of. It is one of the serious questions, and, as yet, there has been no feasible plan made for successfully stamping it out in this State. I would say, Mr. President, there are copies of the law, and the first, second and third biennial reports of the State Live Stock Commission on that table, which are free to all to whom they would be interesting.

Dr. Baker, Lansing: I wish to speak on the same subject as the gentleman who preceded me. The topic was broached by the reader of the paper, Mrs. Hinds. It seems to me that this is an exceedingly important point—the prevention of tuberculosis. Mrs. Hinds has said that the commission acts upon these dangerous communicable diseases when they are reported to the commission. There seems to be no provision in the law for an inspection of the animals around the State. If there were, I

imagine we should find the number of animals infected with tuberculosis would be very much in excess, perhaps, of all the other diseases put together. It seems to me that in this line of work we have done just what is usually done, we have commenced to work at the least important end. I want to suggest that it ought to be so that the Live Stock Sanitary Commission should be able to tell us what proportion of cows in this State supplying milk are afflicted with tuberculosis. And the importance of the question can be understood when we know that tuberculosis is the disease of all others that kills people here in Michigan. If you look at that diagram [on the wall] you will see that we lose 3,000 people in this State every year from consumption. Some of those who die of consumption contract the disease in other ways than by infected milk or meat, many are infected with the dust of the dried sputa that arises from the carpets and floors of halls like this, and other public places. But in the State of Massachusetts they have demonstrated the important fact that the milk of a tuberculous cow will convey tuberculosis even when the udder of the cow is not affected. And in Massachusetts the proportion of cows afflicted with tuberculosis is about four per cent—about four animals out of one hundred have this disease. I do not know whether there is any one in Stanton who keeps fifty cows, but if there is and the same proportion holds good here, two cows in that dairy give tuberculous milk, and that milk goes in with the milk of the other cows, and the whole mass of it is distributed around, all possibly being capable of communicating tuberculosis. It seems to me that it is an important thing to have this Live Stock Sanitary Commission; but I should say, give it the other blade of the scissors. It is now working under a very great disadvantage. There should be an inspector going around the State to find these animals, and the Live Stock Commission should have knowledge of these cows. The reason why nothing is being done to stamp out consumption is because but very few cases are reported to the commission. I happen to know that the State of Michigan has lost quite a number of cows in that way—destroyed by advice of the State Veterinarian. I may be telling tales out of school, I do not think Mrs. Hinds said anything about it.

Mrs. Hinds: Oh, no, you are not; go on.

Dr. Baker: One more point, we have discussed the subject of "animals' diseases communicable to man," I want to say a word about "dangerous diseases of man communicable to animals," and the chief disease in this class is this same disease, consumption. On the extreme left (referring to diagram) we see the bacillus of tuberculosis, fig. 1, page 26. I think it is a good thing to have this image of the germ of this disease clearly in mind. The germ of this disease is vegetable. It is reproduced in the lungs of any one who has consumption. It is spit out around in the back yard, and chickens eat it, and die with consumption. This fact has been demonstrated. The consumptive goes and takes care of the cows in the dairy, spits on the hay, feeds it to the animals, some of the animals contract the disease. If there were an inspector who went around and found every consumptive animal, and the Live Stock Commission destroyed every one of them today, how long would it last? Three thousand consumptive people in this State today are spitting all over the State. It is a vicious circle. We must cut the circle in two or three places before it is destroyed. You must not only destroy the consumptive animals, but we must teach the people not to infect the animals.

Dr. Gamber, Stanton: There is a good deal that might be said in

regard to this subject, but I wish to say a word in regard to tuberculosis. The bacilli which are the cause of this disease when taken into the stomach are destroyed by the healthy gastric juice in eighteen to thirty-six hours, but not soon enough every time to prevent them from sometimes infecting the system. I do not see any other way than to destroy the tuberculous animal, and not allow these germs to get into the stomach, or where they may be inhaled by the human system.

In regard to glanders, provision is made for the destruction of these animals. After they are killed they should be cremated or buried very deeply, but cremation is far preferable.

Another disease, anthrax, sometimes called malignant pustule, (see illustration of bacillus of anthrax, figure 11, page 27), which I think does not trouble the Live Stock Commission now, as Mrs. Hinds tells us that there are no cases in the State at the present time. In San Domingo, in 1770, 15,000 persons perished in six weeks from eating the bodies of animals dead of this disease. The bacillus of anthrax is famous as the first micro-organism demonstrated as the actual cause of an infectious disease. It is the longest known and best studied of all the micro-organisms. This bacillus containes spores, and the gastric juice does not destroy them at all; consequently when they are taken into the stomach, infection is infallable.

Mr. C. T. Wicks, Stanton: What is the effect of cooking the meat that is diseased in this way?

Dr. Gamber, Stanton: Thorough cooking of the meat of the animal dead of this disease is a sure preventive. It requires the boiling point, and if the piece of meat is large it requires thorough cooking so that it becomes heated entirely through, while the meat of tuberculous cattle requires a temperature of one hundred and sixty degrees F. to destroy the germs.

Mr. C. T. Wicks: Would it also destroy germs in milk?

Dr. Gamber: Yes.

Rev. W. C. Burns, Stanton: Would you recommend boiling the milk?

Dr. Gamber: Yes, unless you are very certain that it contains none of these germs. All of these germs that we have been talking about are destroyed by thorough boiling.

One more disease I wish to mention is rabies, or, in the human species, hydrophobia. There are a few points it is well to understand in regard to this disease. The period of incubation after a dog or person is bitten by a rabid animal is on the average from 30 to 50 days, and sometimes it may be from 6 to 240 days, so that we do not know exactly what the time will be in any given instance. This fact should be borne in mind when any person is bitten by one of these rabid animals, for during the time that might transpire before the breaking out of the disease the wound may entirely heal up, and later break out again. We also know that when a man has this disease he is afraid of water, it is entirely different with dogs, they like it.

In countries where they have had the disease among the people they have stamped it out entirely by muzzling the dogs.

Rev. H. E. W. Palmer, Stanton: What about the Frenchman's cure of this disease?

Dr. Gamber: It is recognized as being one of the best at the present day. It is thought that something better has been discovered by an old

Italian physician, Eusebio Valli, but they have not yet tried it upon man. The Frenchman you have reference to is M. Pasteur. He has labored for years and has not yet been able to discover the germ that causes this disease. It is thought, that this poison does not enter the blood, but extends along the course of the nerves until it gets to the brain, and the time it takes to get there, the period of incubation, depends upon the location of the wound; if the wound is in one of the extremities it takes longer to reach the brain, and the period that follows when it once reaches there we divide into three stages: the melancholic, the spasmodic, and the paralytic. It takes 5 or 6 days for these three stages to close the scene with death.

Dr. Baker, Lansing: I left off the point of my remarks, in one respect, relative to one part of the "vicious circle" I spoke of. It is a very simple thing, but it is a very important one, that is to disinfect all sputa, and especially all sputa of all consumptive persons. Not only consumption is spread by sputa, but most of the throat and lung diseases are spread in that manner. It is a simple thing to disinfect or destroy all sputa and that should be done.

HEALTH AND DISEASE.

BY PROF. DELOS FALL, ALBION.

The world has not altogether outgrown the idea which was entertained by the ancients regarding the real nature of disease. By them it was supposed that to be diseased was to be possessed by an evil spirit or demon, some personality which entering the system, laid it under tribute and preyed upon it. The air, the earth, the forest, the streams, the sea were peopled with imaginary beings who were the active agents in all the operations of nature. Health was the result of the control of good spirits; disease of demons or evil spirits.

When this idea was abandoned and a new one substituted for it there was not much advance made. Now it was thought that disease was a thing, an entity, which in some mysterious way was thrust into the system. Coincident with this idea was the other one that the invader into the body could be expelled by medicine. Vague notions of this kind still widely prevail and many regard diseases as things that come or go or are "sent" by Divine providence as judgments or punishments for sin. As in the dark ages, so now, there are some who believe, when fearful plagues and pestilences break out and carry off thousands of people, that it is a token of the wrath of God. Sin has been committed but we do well to have clear notions of the exact time and manner of committing the particular sin which has led to a given disease.

Persons holding these erroneous views retard very much the cause of sanitary reform. Minds fully possessed of them will tend to a passive acquiescence to what is felt to be unavoidable; and the propitiation of Divine favor by prayers and humiliations will take the place of intelligent, persistent and systematic measures for the prevention of disease. So we hear mothers say: "My children must have all the diseases I suppose" and the monstrous sight is presented of a mother deliberately exposing her children to the diseases which are thought to be inevitable.

What then is disease? As it was originally used, the word defines itself, *dis, ease,* without ease. It is an old saying, but none the less true, that the blessings of good health are not regarded or appreciated until they are in

a greater or less degree lost and some one has said with equal truth "the moment we become conscious that we have an eye, a stomach or a heart, or feel any of the silent but wondrous mechanism of which we are composed, disease has invaded that organ or function," and another's definition is in point that "health is the insensible performance of all the operations of the body."

Anatomy and physiology have taught us concerning the wonderful mechanism of our bodies by means of which the different elements of our food are converted by that mysterious influence we call life into the numerous tissues endowed with their various forms of energy. It has also described for us still another complex apparatus for removing this tissue, when, having parted with its energy, it is no longer of service to us. On this thought Professor Huxley has based the following definitions: "The active and unimpeded metamorphosis and prompt elimination of waste matters which gives rise to the most vigorous life, constitutes health; while the obstruction, depression or perversion of these vital changes constitutes disease."

Dr. Kellogg defines these terms as follows: "Health is the harmonious action of all the bodily functions." Still another author says "when our food is properly assimilated, the waste matters properly excreted and all the organs work in harmony, we are well; when any derangement of these functions occurs, we are diseased."

I have quoted these definitions in order to enforce a single thought, namely, disease is a condition or a state, not a thing. Even in those conditions caused by the invasion of the so called germs of disease it is well to discriminate in our thought between the disease *per se* and the bacterium which is the cause of the disease.

There is another view of disease which seems not to be as fully appreciated as it ought and that is *disease in its remedial aspect.* Disease is in most cases an effort of the system to cast off the causes which have brought about its derangement. Disease is then an effort to remedy an existing evil or as Dr. Oswald puts it, "a protest of nature against an active or passive violation of her laws." Pain is the voice of disease announcing its approach and the exact point of its attack. Pain brings to our notice the vigorous efforts which disease is making to restore our bodily organs to their normal condition. As some one has said, pain is indeed a present evil but its relations with the future proves its mission to be merciful. A toothache is a veto measure put upon the abuse we heap upon our teeth by neglect of proper sanitary measures.

If, then, this is the truth in regard to the real nature of disease, let us examine the question as to how it ought to be treated. Surely as far as the disease itself is concerned, it is not the objective point at which we should aim in our effort to remedy the evil.

Suppose we should ask where is dyspepsia? What is its location? Where is the condition or thing that should be aimed at with our remedies? Ordinarily we say the stomach or the liver is deranged and these organs must be treated. We forget that back of the present condition of these organs there is a course of conduct, there are habits, there is food of a certain or uncertain character and that as long as these remain as they are, our remedies, administered to the already abused organs will only at the best but temporarily relieve them. Where shall we locate attacks of dyspepsia? In the iniquitous pastry eaten at the end of a meal after a full and proper amount of the substantial foods have been partaken of,

or in late suppers, food taken between meals, in lack of mastication, in over-eating, in alcoholism, et cætara. Reform these things and the liver and stomach will take care of themselves.

Dr. Isaac Jennings who has been called one of the greatest pathologists of our century, outlined a method of treatment embracing this idea and was wholly misunderstood because he named his method the "Let alone plan." Diseases do not want to be let alone, they call loudly for help, not from their own symptoms which are only so many alarm signals, but they call for relief from the obstacle or cause in the system which has brought about the disease. When that cause is removed nature herself performs the cure. Another putting of the same thought is "patients and not diseases are to be treated." The cause of disease removed, the disease itself will work out its own salvation.

How wide of the mark then, appears the treatment given so largely by physicians, treatment aimed at the disease, medicine to counteract its effects but at the same time paying no attention to the cause of the trouble, taking no measures for its removal. You are sick and the physician asks you what is the matter. You say dyspepsia, and out comes the prescription book and you are sent to the druggist to purchase that which may stay the disease for a time but does not remove the cause. It would sometimes seem as if physician and druggist were in league with one another.

There is, however, a growing tendency among our best physicians to adopt the leading principles announced by the adherents of that method in medicine known as the rational method, viz.: "Nature alone possesses the power to heal." Many eminent authorities could be quoted on this point. I quote only one, not because of his preeminence as a physician but because he expresses thoughts which have been in my own mind in a much more effective way than I am able. Dr. Felix Oswald uses these very forcible utterances: "If I should name the greatest enemy of childhood, I would unhesitatingly say, medicine." He predicts that before the middle of the twentieth century the internal use of drugs will be discarded by all intelligent physicians. He quotes the old saying that "catarrh is the beginning of a lung disease," and remarks "it would be the end of it if we did not aggravate it with nostrums and fusty sick rooms." Again, the breaking up of a pulmonary disease could often be accomplished by breaking the bed room windows," and again, "If a drugged patient recovers, the true explanation is that his constitution was strong enough to overcome both the disease and the druggist."

PREVENTION.

We are now prepared to appreciate the old saying that prevention is better than cure. It was uttered by that eminent metaphysician and philosopher John Locke, over two hundred years ago. The full quotation is "Prevention is better than cure and far cheaper." The drift of medical science seems to point to the fact that in prevention oftentimes lies the only possibility of a cure. To cure the disease is to remove the cause.

During the past twenty years a very wonderful progress has been made in our knowledge concerning the true nature of disease and the various causes which produce death. These causes are arranged by the statistician under five heads.

(1.) Zymotic diseases. These are such as are caused by specific germs, such as typhoid fever, diphtheria, measles, scarlet fever, small-pox, etc.

(2.) Constitutional diseases. Cancer is the principal disease under this head.

(3.) Local diseases, such as convulsions, heart disease, bronchitis, pluerisy, peritonitis, Bright's disease.

(4.) Developmental diseases, such as teething, child-birth, old age, etc.

(5.) Violent deaths, burns and scalds, poison, railroad accidents, drowning, homicide, suicide, etc.

Of the causes here enumerated the sanitarian confines himself principally to the first class, for it is the zymotic diseases which from their nature we may restrict and prevent.

The present population of Michigan is about two and one quarter million. Of these about one and three-fourths per cent or about 40,000 will die before the end of the year. Stated in another way, the number of deaths in our State for a year is at the rate of seventeen to every one thousand of inhabitants. It may be that owing to some imperfections in the method of obtaining vital statistics, this ratio is somewhat smaller than it should be.

It is as low as any state in the union and much lower than in many states. In Massachusetts in 1888 the death rate was 20.59 per thousand of the estimated population and its average death rate for the period of thirty-eight years, 1851–1888, was 19.48. That state has a much more accurate system of registration than ours and it is probable that our death rate approximates to that of Massachusetts.

In New Hampshire, in 1888, the death rate was more than 18 per thousand; in Rhode Island the annual death rate exceeds 16 per thousand. By way of comparison the following figures will prove interesting. The death rates, per thousand, of some of the foreign countries for 1888 were as follows: England and Wales, 18.8; Scotland, 18.7; Ireland, 18.3; Sweden, 19.2; Austria, 28.9; France, 22; Switzerland, 20.4; Norway, 16.1.

By these figures it will be seen that Michigan compares favorably with other countries in regard to its healthfulness; nevertheless it is true that by proper sanitary measures the death rate may still further be decreased.

Speaking more specifically of the causes of deaths in Michigan we may say that the five diseases which cause the most deaths are consumption, diphtheria, pneumonia, typhoid fever, scarlet fever. At least eight thousand or twenty per cent of all deaths are from these causes. Of course, this order may be varied from year to year due to epidemics of other diseases which may occur.

To return, now, to that question which has been the main motive in writing this paper, we inquire, what is the true attitude to take toward one of these cases of communicable and preventable diseases.

One of the children of the house, for example, develops a case of scarlet fever. What shall be done? What is the most important thing to be done? We ask of the mother or the father of the child and their answer is born out of their tenderness and parental solicitude for the one sick and they say, bring the physician that he may stay the disease and save the life of the child. That is all right and proper, the physician is needed to give counsel out of his previous experience with similar cases. The patient's system may be aided in its struggle against the ruthless invader, the scarlet fever germ, but other things must be remembered. The physician knows, if you do not, that the disease will inevitably run its course before it yields

either to the effect of his drugs or the natural resistance of the system of the patient.

The main thought, the real burden of parent and physician alike should not be so much with the sick sufferer as with those who are, up to this time, perfectly well. The first thought should be with reference to the communicable character of this disease and the first act should be to render as perfectly as possible the isolation and separation of the one sick from those who are well. Properly managed, this may be the only case of this disease occurring in this house or in the neighborhood; improperly managed, an epidemic, wide spread and dreadful in its ravages will be the result. Prevention is the watch word now and the steps taken to bring this about must be prompt and vigorous.

This work of prevention however ought to have been begun long previous to the outbreak of this disease. I am convinced that there is an acquired immunity against contagious diseases and especially against those systemic disorders and derangements which are looked upon as minor matters in comparison with a serious case of diphtheria or typhoid fever. Disease germs do not ordinarily make their way into the system of a person of sound physical condition; but where some portion of the air passages or the digestive tract or other portion of the system is impaired by irregularities in life, by careless exposure which produce colds and inflammations, or by other means, weak points are established with low resisting power and here the disease germs find ready entrance as well as material upon which to feed and propagate.

The *present cause* of the supposed case of scarlet fever, then, is the invasion into the body of the specific germ of this disease; the *remote cause* and one no less important to consider is that chain of circumstances which has brought the system to a condition when it is not able to resist the attack.

What to do now that the disease has been established is pretty well known or may be known by consulting the pamphlets and circulars prepared by the State Board of Health for free distribution to all who desire them. This paper would rather emphasize the means by which the remote cause can be prevented and by which in a large sense, immunity may be gained and maintained.

The principal thesis maintained here is this: A sound body furnishes the best power of resisting an attack of the much dreaded communicable disease. How shall we maintain a sound body? We repeat, not, in many cases at least, by the administration of drugs, though they may be prescribed by the wisest physicians; but rather by the application of the laws of physiology and hygiene to those sanitary agencies which are in common and constant use.

The principal agents which are absolutely necessary to the preservation of sound health may be grouped under six heads as follows:

(1.) A constant and abundant supply of fresh air. This will include the necessity of spending as much time as possible in the pure outdoor air, and more especially intelligent ideas concerning the best method of procuring and maintaining pure air in the house and school house, in the sleeping room and office, in the work shop and the factory. Ventilation is still a vague, mysterious, little understood and much abused term. Perhaps less attention is paid to this than almost any other sanitary agent and yet it is the most important.

(2.) The second sanitary agent in common and constant use should be

frequent administrations of pure water to the body within and without. The ordinary philosophy indulged with reference to this subject will not do. It is fallacious in the extreme. It runs like this, water is everywhere in great abundance; it has been prepared by nature and is therefore pure; thirst is implanted within us as an infallible guide as to the time of its use and the quantity to be used; the æsthetic faculty of cleanliness is divinely implanted within us; dirt is abhorrent to our natures, water is the remedy, if only it is applied often enough and in sufficient quantities. So we drink when we are thirsty, we drink such water as has been produced by nature. We bathe in a manner and at a time when it is most convenient. All this is very wrong, but the limits of this paper forbid that time should be taken to suggest corrections to the evil except by the utterances of a few sentences. Water that nature produces is scarcely ever pure, it must always be carefully scrutinized and inspected. Taste is not an infallible guide as to time and quantity of water drank. The taste is vitiated and there are purposes for which water is needed whether one is thirsty or not. Water is needed to keep the fluids of the body properly diluted; much water is needed in order that the processes of disassimilation and assimilation shall be properly performed; much water is needed as a depuritive or cleansing agent, passing into the body by way of the alimentary canal and passing out through the tissues, bathing and cleansing them and making their escape by way of the perspiratory ducts.

The bath is not alone taken for the purpose of cleansing, or if taken for this purpose it oftentimes takes on the character and performs the function of a powerful and effective remedial agent or if wrongly used an agent producing more harm than the mere presence of dirt could ever do. How to bathe, when to bathe, the temperature of the bath, the effects which will be produced by baths at different temperatures, these and many other points should be intelligently appreciated before one tampers with as apparently a harmless agent as water.

(3.) The third sanitary agent in common and constant use which I name is, a proper supply of wholesome and nutritious food. Here many costly errors are made, errors which result in impaired digestion and as a consequence the impairment of the whole body. Too much food, too rich food, too rapid mastication, lack of proper insalivation, the whole meal dispatched after our American "twenty minutes for dinner" fashion, food taken between meals, food partaken of while the cares of business are still carried by the mind, the precious pie, the deceptive pudding, adulterated foods, condiments and spices, these and a score of other sins dietetic are we guilty of in our careless and extravagant methods of living.

(4.) A due amount of daily systematic exercise for body and mind and soul. A study of this trinity of factors which go to make up our being reveals the fact that in every part they are designed for action. Activity is life, inactivity death. Labor, which is a form of exercise, is the normal condition for man, both in this world and in the world to come; labor is the most natural method of complying with the great ends of his being. Exercise proper is the use of the parts of our being not brought into action by our regular work; it is supplemental to the effects produced by the daily toil. We do not always remember this. Our inclinations lead us, when we take exercise, to do that which we can do the best; we ought rather to strengthen the weak parts.

The effects of regular exercise are many and plainly evident. For our bodies it results in the quickening of the circulation, the strengthening of

the digestive powers, and the enlargement of the lung power in consequence of the increased demand for oxygen. Exercise makes greater waste and thereby hastens the assimilative processes thus keeping our bodies in an active condition of change, of waste and repair, without which derangement takes place and disease sets in.

Again, the true sanitarian will agree with the great body of physiologists and psychologists that the mind is not only intimately dependent upon the body but that they closely and powerfully react upon each other. Soul and mind and body are indissolubly bound together in a living unity and what affects the one similarly affects the other. All that can be said of disease and health, labor and exercise, as pertaining to the body is most emphatically true of the mind and with certain modifications also true of our higher spiritual nature.

(5.) I name as the fifth sanitary agent in common and constant use, *a sufficient amount of appropriate clothing.*

(6.) Proper associations at home and in society. The influence of these things upon the longevity and healthfulness of man has not yet been pictured so vividly that all see it and resolve to act accordingly.

Dr. Baker, Lansing: I appreciate that paper very much, but there is just one point I want to dissent from, that is, Professor Fall's criticism of the doctors, and his advice to the people not to ask the doctor's advice in sanitary matters, I think that is a mistake.

Prof. Delos Fall, Albion: I did not say so, at least I did not intend to convey that impression at all.

Dr. Baker, Lansing: Perhaps I misunderstood it. I think the physicians are our leading sanitarians today. I do not think there is any doubt about it, and if others had the same impression of that point that I did I should like to have it corrected. I understood him to say, and if I am wrong Professor Fall will correct me, I understand him to advise that when you are looking after sanitary affairs you are to ignore the physician. I think the leading physicians as a rule know very much more about sanitary affairs than do the other people. When we go to a physician and ask for his advice do we ask him for the sanitary advice? Do we not, as a rule, ask for the other, and feel willing to pay for it and unwilling to pay for the sanitary advice? The physician is the one who should be asked the sanitary question, for the leading sanitarian in every community is a progressive physician. He knows all about these germs, and my advice to you is, ask your physician for the sanitary advice, and pay him for it and you will have less of the other kind to pay for.

Prof. Fall, Albion: That is just what I had in my own heart to say. I do not think the time will ever come when we shall not need the physician; his kindly offices will ever be in request by us and we shall pay for it. Physicians as a rule are better informed in sanitary matters than any other class of people.

I have gone this week, at the solicitation of a physician of my own town, a long distance out in the country to see what the physicians consider an evil that will certainly thrust bad health upon the community in which we live. His anxiety is to remove that evil which will inevitably bring disease and death to the people of that country. I do not find any other class of people whose eyes are open to the evil and appreciate it as much.

We do need the physician for another purpose than this for which we have employed him so long. We now have the idea that the physician must give us medicine and we pay him for it, that is what we want, but

the physician of the future, in my judgment, is not the man who dispenses drugs entirely but he will look after us and our sanitary surroundings and will keep us well in place of waiting until we are sick and then giving us medicine, and we will pay him for it. Physicians as a rule make vigilant, wide awake sanitary inspection officers. We want to change the attitude of the physician towards us and we want to change our attitude towards them. We want to change our way of living more, and drug less, and the physician will be on the ground all the time.

SCHOOL SANITATION.

BY PROF. J. E. FARNHAM, SUPT. OF SCHOOLS, STANTON.

The world has been taught that brain work is antagonistic to physical development. This might be inferred from the sensational articles appearing in our newspapers from time to time.

In some illiterate districts the schools are looked upon as organized machines for slaughtering the youth and children of the land. Mental activities and thorough mental training stimulate physical growth. It is assumed when the little five year old enters school that his reasoning faculties are still dormant, that his conceptive faculties, his memory, his powers of association and classification are just budding and sprouting, and that he has little or no powers of attention. It is the business of the schools to receive the children in this condition and develop in them symmetrical, powerful, mental faculties. The course of study and daily program of work are based upon certain fundamental principles in mental growth.

At first the exercises are many and various of from ten to fifteen minutes in length. These exercises are mostly objective; reading, spelling and counting with objects, with an intermixture of kindergarten employment make up the child's daily history. From term to term and from year to year the number of exercises per day are diminished and the time of each lengthened; the conceptive faculties are exercised, the memory is more and more taxed, but up to the fourth year no book is given the child except a reader. After this comes systematic analysis in arithmetic, construction and correction in language, geography, map drawing, history, writing and the rudiments of botany and natural philosophy.

During the first eight years only the practical branches have been taught notwithstanding the disciplinary purpose of the course of study. In the high school the regular number of recitations should be three of nearly an hour for each, besides the drills in penmanship, spelling, music, and physical culture. The principal object here is the higher and severer discipline of all the mental faculties, and yet here the course is carefully graded: each term's work being a little harder until the completion of the course. Sometimes school boards and superintendents fail in the selection of proper text books or in arranging the studies in the course but this is no fault of the school system. The pupils in the school are generally robust and healthy. There is an occasional invalid and an occasional death among them, but these are not the fruit of over education. They are the fruit of inherited debilities, improper diet, improper clothing, irregular rest, broken sleep, the exactions of society and fashion, etc., things that do not come within the jurisdiction and responsibilities of the school.

As was said by Superintendent Perry in his argument on this subject "even if it be granted that an undue proportion of our pupils are breaking down in health at school it does not follow that the causes will be found in their school labors. There is no more mischievous style of reasoning in vogue than that which connects by cause and effect facts which stand in juxta position. The barometer falls and it rains therefore the barometer causes the rain. Society is full of fallacies arising from such methods of reasoning. The pupil shows signs of failing health, the physician is called and he inquires into the history of the case. The most immediate and obstructive fact is that the patient has been at school six hours a day. Erring judgment naturally charges the school with being the probable cause, at any rate it is comforting to have a cause. Now instead of advising a cessation of brain work it would often be more christian like (although not the popular thing to do) to prescribe better protection for the feet, less society and the street, more sleep, more judicious physical exercise, more fresh air in the sleeping room and less sour bread, candies, knicknacks and cigarettes."

Says J. G. Fitch in his lecture on teaching: "For one case of permanent injury by too much mental exercise there are twenty cases of those suffering from idleness or inaction."

Professor Bascom says: "Society is more to be dreaded than education."

There is an opinion abroad that education ought to be made easy, this is a mistaken idea. Strong minds do not grow like the trees in the forest nor do they flash forth as a meteor. They are forces forged in the heat of intense mental effort and study.

Study is toil, it is rapt attention for definite results, it is agony of the soul issuing in victory. This is the brain exercise which we claim is conducive to health. Hard brain work engenders a strong will, an iron will is the companion of great physical endurance.

A powerful will rises superior to vexations, obstacles, and enemies that crush feebler spirits. Its possessor often continues to live and thrive simply because he will not yield.

Brain workers live in a calmer atmosphere, order life's burdens and experiences more wisely; they take a broader view of life and so escape much of the worry and care that drives so many into premature graves. Therefore I say mental activity is conducive to physical growth.

Physical training is as necessary as mental training if health and great usefulness are the objects.

We can just as well have progressive physical improvement from primary to high school as not, if we (parents and teachers) cease to worry the children and will earnestly and zealously teach physical culture. The vigor and grace and development of the body should be as distinctly considered and provided for in our educational system as the mind. Every school building should have a gymnasium, and each pupil should have at least one lesson a day of thorough systematic physical exercise; and the study room should be large and airy so that light gymnastics could be had at any time. The time necessary for physical exercise should never be abridged, for these exercises promote instead of hindering study; they relieve tension, draw off nervous irritability, equalize circulation, deepen respiration, and return the children to their books renewed in mind as well as body, and capable of attention and application which were impossible to them five minutes before. These exercises should be a part of every session in all grades, and, in the lower grades should occur oftener than once in each

half day. If this were done regularly, intelligently, conscientiously, and with spirit it would effect an improvement in the physical development of the children and temperament of the teacher.

According to statistics one-third of the children die before they are five years old, one-half only living to the age of twenty-one. The great problem is can our sanitary laws be improved so as to reduce this startling death rate? Can not the sanitary conditions of our schools be improved so that our boys may grow to healthy and vigorous manhood, and our girls have added to accomplishments and grace the beauty of true womanhood, soundness of body and soundness of mind? The schools have much to do in this respect.

In the first place, the school grounds should be dry, spacious and sunny. Any expense for drainage would be gained in the life, health and happiness of scholars. If the grounds be wet the children's feet will be damp and consequently cold, the circulation is impeded, then arises the danger of congestions from inactivity.

The grounds should be large enough so the girls and boys could each have room for all to participate in the out door games. In front of the building should be a grove of shade trees to invite the more delicate ones out in warm weather. In reference to the water supply, for want of time I will not discuss the subject, further than to say our Stanton schools are well supplied from the water works.

In discussing the architecture of school buildings many points could be taken up and each one made the subject of a lengthy discussion. The Stanton people should be fully alive to the question of a new building. The shape and size of school rooms have not received the consideration that their importance demands. The shape of the rooms to serve the best purposes of heating, lighting, and ventilation should be an oblong three-fourths as wide as it is long. The size of the room should admit of at least ten square feet of floor and one hundred twenty cubic feet of air for each pupil.

White-wash or color-wash should never be used for they soon become dirty and saturated with impurities from the carbonic acid gas, then flake and fall off. Wall paper is still more dangerous in absorbing and liberating poisonous gases. Nothing is equal to a thoroughly painted wall, for it can be washed when necessary. Let there be plenty of large windows so placed that the light shall come from above the child when sitting.

The happiness of the children and the strength of their bodies depend largely upon the amount of sunlight admitted.

The mental effects of deficient light is also accompanied by physical effects. Human beings like plants grow weak and pale without light. It is an old saying but still true "where the light cannot come the doctor must."

Short sightedness is often the result of poor lighting and bad reflection.

The blackboards should be on the right side of the room and in front while the light should come from behind and the left.

The subject of seating should attract more attention. Usually it is well graded and fitted to the mass of pupils but there are a few dwarfs or overgrown children in each grade that cannot fit themselves to the seats in their grade. These children need more attention than the rest, suitable seats should be provided for them. There should be a reform in the size of desks. If the desks were one-half wider and a half longer we could

expect better written work, fewer flat breasted, round shouldered pupils, and far more easily governed schools.

The proper ventilation of the school room is very important. The teacher should become thoroughly acquainted with the system employed in his or her respective school building. When the outside air is quite similar to the inside then to open the windows from the bottom is refreshing and will not cause chilliness. But in winter the marked difference between the air in the room and that outside makes it necessary for the teacher to be cautious in opening windows in order to avoid drafts and sudden changes of temperature. In cold weather the windows should not be opened from the bottom, the heat from the furnace may be shut off and when this is done in rooms where the Smead system of heating is used a current of cool fresh air is introduced into the room through the register, the windows are to remain closed. Where this system is not used, when practical and necessary, one or two windows may be lowered from the top a few inches. The rooms should be at least twelve feet high to give ample space for the poisonous gases to rise above the scholars when standing.

We cannot expect anything else than sickness among children and teachers when the wind and snow blows through under the room and up through the floor, when the children's feet are cold from the time they leave home until their return and when there is no means of ventilation only through windows and doors. When stoves are used they should be large enough to heat the room with two windows lowered from the top.

The water closet is an essential that is often overlooked. It should be as distinctly a part of each school building as the cloak room, and not be set apart and ignored by school officers, teachers and janitor. It is in these filthy out houses where little ones learn the first lessons of vice. Let the closet be warmed, ventilated, swept, dusted, washed and kept just as neat as any room. The upper floors should each have a closet for girls. The dry-earth closet has proven the cheapest and best. No vault is required, the base and drop of the closet should be built of brick and water lime and open at the ground to the outside by a drop door. A barrel of powdered clay or road dust mixed with lime should be placed in the closet and about a pint of this thrown into the drop when used. To make them still better their ventilating flues could be connected with the furnace and the chimney thus making them dry and perfectly secure against any bad odors.

While progressing so admirably in the science of lighting, heating and ventilation there is one very important point overlooked or ignored, the injurious effects resulting from climbing long flights of stairs to reach the upper rooms. This point has been most forcibly impressed upon me while watching the pupils climb three flights of stairs as the high school pupils do at Holly and Rockford. From a close observation for several years I cannot refrain from making a solemn protest against the erection of any school building above two stories high. By the present system of seating pupils begin with the primaries on the ground floor and ascend with the advance of grades; our girls reach the higher floor just at that delicate period in their lives when they pass from girlhood to womanhood. At this critical period they are obliged to climb several times a day long flights of stairs for four long years, laying the foundation of future ill health, while many are compelled to leave school before they have finished the course. Owing to the crowded condition of our grammar room this year our seventh and eighth grades have been obliged to ascend and decend the hall stairs on an average of forty times each week. These are facts which every con-

siderate parent should look to, and for which a remedy should be immediately prescribed.

A new school building properly arranged would be the best prescription for our case.

The duties of parents and teachers are important factors in the preservation of good health among school children. Parents should clothe children so they are comfortable in any change of temperature. They should feed them on good wholesome food at regular stated times. The children should reach the school house dry shod, they should have plenty of physical employment while out of school and not be allowed to saunter about the streets idly. Good restful reading should be in every home where the children should be found evenings, retiring at the proper time so that when they enter school in the morning they are rested, fresh, and ready for work. It is not difficult for the observing teacher to point out those who are reading light, trashy literature. Their mental and spiritual intoxication is as evident to the teacher as the unsteady motion of the drunkard is to the casual observer. Again parents have a responsible duty to do when employing teachers to train and have charge of these young and tender plants. Children are imitators and reflectors, the teacher readily knows what kind of training is given at home and the parent can easily see from the reflections the kind of training given at school. Teachers, we have a great responsibility, much more than some are willing to assume. We are responsible in a great measure for the mental, moral, and physical development of our pupils. Have we each pupil's physical as well as mental welfare at heart and can we do for and look after the poor ill fed, ragged children as much as we do for those who have wealthy and influential parents? If we cannot then we are not true to the trust assigned us.

Do we make a study of the physical needs of our pupils as much as of the lessons we teach them? If not, then let us do so from now on. Do we scold, fret and worry at our pupils? Their nerves cannot be calm under such treatment. Do we sing, laugh, and make our school rooms the pleasantest places the children know? If not, why not? Are we daily adding to our stock of knowledge by diligent study and reading? To be progressive teachers we must keep with this advancing education.

DISCUSSION.

Prof. Fall, Albion: Education. I know more about it than anything else, I am a teacher, and expect to be a teacher as long as I live. I never enjoy myself so well as I do in my recitation room. It is true, therefore, that I am in sympathy with the facts of the paper.

Are we all, as citizens, patrons, scholars, parents, as thoughtful about our relation to the schools and the relation of our children to the schools and of the teacher to the schools, to the school house and the provisions we make for the children, as we should be? Do we reflect that more than one-third, for most people, of the life of every person now-a-days is spent within the walls of the school room? Twelve years of school life which brings a child through the primary grades, grammar school and high school, and if four years more of college is added to that, sixteen years out of the so-called thirty-three years of the tenure of life, is spent within the walls of the school room. Our children spend their lives there; we owe it to those children that their surroundings shall be as pleasant and as

thoroughly for their welfare as are their surroundings which we make for them at our homes. I think the school house and school rooms ought to approximate to the comforts and pleasant conditions which we strive to make in our own homes. Our children enjoy the privileges which we put before them. Most people who send away children to a school have a definite purpose in view, and that is just as the professor has brought out, thorough mental training, thorough mental discipline. That depends upon the physical bodily health in a great measure. A sound mind in a sound body is an old truism. Our scholars cannot have sound bodies in imperfectly ventilated and imperfectly heated school houses. Ask yourselves the question—is the high school building in this city—(That reference that I made this morning was purely an accident. I used it as an illustration not knowing what the character of the building was.)—is the high school building in this city what it should be? I want to press this question, and I hope it will not be thought an impertinent thing for a stranger to ask the question, is the high school-building in Stanton what it ought to be? Is it right that the feet of your children should be pressed down upon a floor the year around with cracks and crevices through it, especially a floor under which a free access of air is allowed at all times? A school house without a foundation under it, simply boarded up on the outside so that the cold winds of winter come underneath that floor? With the best system of heating in the world you could not heat that school house and make it comfortable, let alone stoves, and small stoves at that, it is impossible to do that.

The superintendent tells me incidentally of his five-o'clock-in-the-morning visits to the school house in order to get a fire started and an attempt made to make the temperature of that room comfortable by the time the scholars came. It cannot be done. You can begin that effort at five o'clock in the afternoon and work until nine o'clock the next morning and you cannot make that room comfortable. Am I saying things that are not so? I beg your pardon, I am saying things that are so. I am sorry that Stanton has not a better school house, aren't you? And hasn't the time come, is not the time now, when this progressive, wide awake city should have a school house that will be a credit to your town? Seems to me so, and it is needed. We should become thoughtful on this subject, and a school house should be provided and the welfare of the children should go on and we have as a result sound minds in sound bodies.

More sums now-a-days are being expended for physical culture and gymnasium appliances, recognizing the fact that sound minds cannot be trained in unsound bodies. Suitable physical culture should be provided for. One of the first things should be a warm, well lighted, well ventilated room in which our schools are held.

Begging your pardon for saying these things that are in my mind, in plain English that all understand, I would like to hear from some of the citizens of this place. Let them say "we should have a school house" it would be a good speech to make.

Rev. Mr. Nease, Stanton: I have not examined this school house with reference to some matters that have been mentioned so as to be able to speak intelligently on that matter, but I have had experience in teaching, and I have had experience in the matter of ventilating school rooms and keeping children comfortable.

I would like to say here with emphasis that parents ought, as many of these school houses are built, to send their children to school with much

more clothing on their feet and limbs than they are sent with. When school houses are supplied with fresh air from the windows and heated with stoves the floors must of necessity be cold. That leaves the head that does the thinking in the warm air, and the feet in the colder air. What must be the result?

I have seen but few school rooms that I think are anything near perfection in ventilation. They can be ventilated in such a way that you will find but little difference between the heat on the floor and the heat up in the room at the level of one's head when standing. The trouble is that the building is built very often more for the appearance, than our friend here has spoken of, than for the sanitary conditions, and the real work that is to be done in them. Architects study more for beauty, many times, than they do for utility, the result is that many of our school buildings are not proper places for children to be in. Take such a building as the nice high-school building at Ionia; unless they have changed the mode of ventilation the high-school room is not properly ventilated. I tried it myself, and the air flues which were intended to carry the impure air out were letting the cold air in, in strong drafts and flooding the floor with cold air. The best way I know of ventilating a room is to have air flues that carry the air from the floor, and arranged in such a way that the air is heated in the flues, causing it to rise, and draw the cold air off from the floor.

This subject, the care of children in school, is an important one. I want to say this much further, that teachers are often times blamed for things that they cannot help, and that many times the trouble, the sickness and the indisposition of children, is not due to neglect of teachers. They are doing the best they can with the appliances they have, and the fault is not with the teachers but with the surroundings; and many times with the condition of things at home, on the street, and in society. So dear friends I believe that there is no class of people that work harder; that have more responsibility put upon them, than the honest, careful, earnest teacher.

Mr. P. T. H. Pierson, Stanton: I would like to ask Prof. Fall what he thinks of the location of the high school building here?

Prof. Fall, Albion: You have half a dozen sites that would be preferable to that one, in the city here. Prof. Farnham pointed out that there is no place for a play ground, a ground that can be ornamented and fixed up so all the citizens and the children would enjoy it. I think there are plenty of places, sightly places, in the town here that would be very much better.

FIFTH SESSION, FRIDAY, APRIL 28, AT 7:30 P. M.

RESTRICTION OF CHOLERA AND TYPHOID FEVER.

BY ARTHUR HAZLEWOOD, M. D., MEMBER OF STATE BOARD OF HEALTH, GRAND RAPIDS.

[Stenographer's report of an unwritten address.]

I regret very much that my esteemed friend, Dr. Vaughan, is not with us. His familiarity with the subject of germs is such that he can talk by the hour, and give you pleasant feelings at the same time. I therefore do not stand here as his representative, or hope to give you that amount of information about germs which he is capable of doing, but as he is unavoidably absent, simply to do what I can, and say a little about typhoid fever and cholera.

They are both of them known as filth diseases, and I presume in the getting up of this program they were coupled together because of the fact that both of them have, you might say, their chief symptoms within the cavity of the bowels. They are both of them germ diseases, so considered at the present day. We have here in this diagram the cholera germ known as the spirillum or bacillus, (See Fig. 6, page 26.) and in this other one are the bacilli of typhoid fever. (See Fig. 4, page 26.) They are classed, both of them, as communicable diseases. There is much intermingling in the mind of the people of the terms infectious and contagious, so I think the better word is "communicable," and by communicable I do not want you to understand that the simple fact of entering an apartment, or a house, where there is a person suffering from either of these diseases, necessarily must give it to you. In these two diseases those particles which pass off from the bowels are the source of danger, so you say, how can that possibly affect us? We do not come in contact with any such excrement except to carefully carry it away. But the question is, do you carefully carry it away? In very many instances it is not carefully carried away, and therefore is the source of communication from the sick to the well.

How, then, does this communication usually occur. There are numerous instances on record of typhoid fever having been conveyed from the sick to the well, that is to the well feeling people, by the means of water communication. A very notable epidemic of typhoid fever in Plymouth, Pa., some years since, was brought about by one man. He being sick on a little spur of the mountain in the early spring before the snow had melted, and the discharges of his bowels carefully carried out of the house, I grant you, but very carelessly thrown out on the ground outside, and so, as soon as there was a thaw of the snow and ice in that vicinity, was carried down into the mountain stream which a short distance below was used for the water supply of the city of Plymouth; and a very large number of persons within a few days became affected with typhoid fever, and that epidemic for that city was a very disastrous one, causing a great many deaths and a large amount of sickness. And yet that could easily have been prevented had the people known the danger, and taken care to see that the discharges from that individual were properly destroyed or disinfected.

Numerous other cases might be cited, especially one in Switzerland,

where on one side of a hill a patient was sick with typhoid fever. His excrementitious matter was thrown out upon the ground, carried through the ground in an underground stream to the other side of the hill lower down; there was no direct conveyance, and yet the water, as was demonstrated afterwards, conveyed the disease to the village on the other side. In other instances the milk supply has been the source of conveying the disease, not directly by the cows having the typhoid fever, but by the washing out of the milk cans with water that had been contaminated. These milk cans were carefully washed with water supposed to be all right, and yet a few germs left in the can would, in the milk which is one of the best breeding places for these germs, soon develop very freely and largely, and the party using the milk would become infected with the disease.

Cholera has very much the same characteristics. It is usually conveyed through the water-supply, and yet we are not sure that these are the only means of conveying it. I feel quite satisfied, from a little experience that the State Board of Health had at Jackson, that by breathing in sewer gas under certain circumstances, the germs of typhoid fever might be conveyed in that way. Some years ago the authorities of the Jackson State Prison were troubled about typhoid fever, and they invited the State Board of Health to coöperate in ferreting it out. Upon that occasion we found a bad sewer in a certain region, and directed that some digging be done incidentally in our presence, and the result was we got a very strong smell from the sewer entering into one of the corridors. More than one member of the board was made faint by the odors, and one at least suffered from a mild form of typhoid fever afterwards. So that it is possible to be conveyed through the atmosphere.

If we take it for granted that the germ is the cause of this disease, we are quite certain that the simple matter of drying such germs sufficient to have them transported by wind or by movements of the atmosphere, generally is not sufficient to destroy them. And yet I do not wish to alarm you unnecessarily.

Cholera of itself has done comparatively little killing in the State of Michigan, not nearly as much as typhoid fever; and yet few of you are very much alarmed about cases of typhoid fever in your midst. I think you should be fully as much alarmed about typhoid fever; and if you were so then I think there would be very little cause for alarm about cholera, if all of you take the precaution for the restriction and prevention of typhoid fever, you certainly will restrict the other disease.

What then do I consider the necessary means for the restriction and prevention of cholera and typhoid fever?

They are sumed up in one word, cleanliness. Now, cleanliness to my mind covers a very large ground. There is cleanliness of body, cleanliness of mind, cleanliness of surroundings, immediate—that is within your own house. bedrooms, etc.—and cleanliness in the city, village or township where you may reside. By this word "cleanliness" I mean a great deal more than simply taking the corner of a towel and rubbing your face over with one end of it and calling that washing your face. I mean something more than putting on undergarments and wearing them day and night for a week without changing, finishing up with the bath and change of linen and undergarments; I mean more than that. My cleanliness of person means a daily complete water and air bath; not simply a towel rubbed over the face, but a good thorough rubbing of the entire person from head to toe

and exposure to the atmosphere whilst doing it for as many minutes as you can afford, without clothing.

I mean the removal of your undergarments every night and sleeping in a clean night dress. Some of you who are very weakly should act in this regard under the direction of your physician. Some of you may not be able to change every night and put on a night dress and put on the same clothing the next morning. Some of you claim you are too cold and you cannot sleep. If after investigation this should be the case you can sleep in the same garments for two or three days and then put on clean ones.

I mean your bedrooms should be ventilated. This thing of putting yourself in a six by nine or even ten by twelve bedroom, with the windows closed and doors closed, and no fireplace in it, and you get up in the morning with a headache—it means you have simply poisoned yourself, poisoned your own bodies with exhalations from yourself. No person can live in a close chamber and have any comfort. Nay, were it not for the imperfections of our houses that let a little air come in where we have striven to keep it out, many of us would be dead in the morning. You need, if there is no other appliance for keeping it open, you need a board six or eight inches wide placed under the window to keep it up and let the air come in. That will do it, and without any great amount of draft too. This is a simple convenience and you can all have it and you may thus avoid a headache in the morning, and thereby tend towards building up a good physique which will enable you to resist disease. These germs, granting it that the diseases spoken of are conveyed by germs, must exist most of the time somewhere, and at some time we become exposed to them, and being exposed why is it that so few in comparison come down with the disease? I claim that it is because the individual has resisting power within himself or herself which is able to destroy a certain portion of these germs, and therefore enabling the person to resist the disease. And if you have contaminated yourself, letting in the poisons which you should throw off, then these germs find a more ready breeding place and develop the disease within you almost surely. So that I claim this, that even if the germs are present if we are in a healthy condition we may throw them off; that we are responsible for ourselves and for those immediately dependent upon us in so shaping and ordering our lives that we may avoid these at least communicable diseases.

This need of personal hygiene I wish to emphasize a little further. Articles of food taken by a great many persons are made perhaps to please their palates, not always that, however, but in a great many instances; and too much food, of certain qualities, is introduced into the system, and of itself acts as a poison. However, I simply just mention this fact, I am not going to take up your time with a dissertation on different forms of food, but simply call your attention to the fact. That you will find that where such has been the case, of young children up to thirteen or fourteen years of age, as some of our English friends do it bring them up on bread and milk or oatmeal and milk with perhaps once a week or twice a week a small allowance of meat, you find the children have rosy complexions, clear skins and robust forms; yet, after a few years introduction to the ordinary table they change in character, in appearance, and in health. And I think this matter of clothing, this matter of bathing and this matter of food are things which all of you should take more to your own consciences and thoughts and see that you are developed as finely as is possible to make you.

Then the subject of the care of the sick patients, either with typhoid fever or with cholera, comes of course largely under the dominion of the general physician and the nurse; but all of you should really understand the necessity of coöperation in such cases, and of seeing to it that your physician and nurse are not derelict in the carrying out of these things. The State Board of Health has issued a pamphlet on the prevention and restriction of cholera and typhoid fever, in which you will find directions given you for the disinfection and destruction of all excrementitious matters that pass away; of the proper care of the sick room and the proper burning of the clothes used about the sick in preference to washing them, and then in such case where the things cannot reasonably be destroyed by burning them of putting them in a disinfectant solution, and see that they are washed and boiled thoroughly before being used again by any other person. So also of the cleansing of the room by fumigation after the sickness has passed away; and in case it should be unfortunate, that the corpse is also disinfected and sealed up so that the final exercises and conveyance to the cemetery may give as little ill results as practicable under the circumstances.

Typhoid fever means a great deal to the United States. Here in Michigan, I regret to say that the death-rate from the disease is considerably more than it should be. It is about four times as many per thousand of the inhabitants as it is in such cities as New York and London. That ought not to be. For every death from typhoid fever it is a safe computation to make that there are ten persons sick; and if you consider the cost in money only to the community you may readily figure out a very severe bill. Each case of typhoid fever means at least a month of cumpulsory idleness, and if the wages are only fifty cents a day that would amount to fifteen dollars, and half of you would not care to work for that rate. Then again there is for a physician, he will put in a bill for anywhere from fifty to one hundred and fifty dollars besides. Then there is a nurse, and if you happen to live in a city and hire a trained nurse fifteen dollars a week. Take the whole sum together, and multiply it by the thousands that are rendered sick by this one disease, and you can readily figure out that it would be much cheaper to prevent it by the introduction of pure water into the household, and by taking care of your surroundings.

I presume that in the talk upon the disposal of excreta you were given instructions how to care for those things. Let me simply call your attention to the fact that fire is our best disinfectant and destroyer. That where it is practicable to destroy any excrementitious matter that is of no further use in the household, burn it; certainly make preference of that. And where it is necessary to do otherwise, then let it be destroyed by using acids, sulphuric, nitro-muriatic or carbolic in such a way that the germs existing in it, if any, may be effectually destroyed, and do no harm to others. And see to it especially that your water supply is above reproach. If it is not, constitute some member of the family a committee of one whose especial duty it is to see to the purification of the water supply; what I have frequently recommended, and done in my own household, is by taking contaminated water, filtering and boiling it.

Maybe all of you have heard of the method of living of the Chinese on some of the rivers and boats, where they make their home on boats packed very closely together, and use the water where their boats float, both as a water supply for culinary purposes, and as a cess pool. The way it is done is

by boiling the water. They make tea from boiled water, and if you boil the water there is no need of having typhoid fever or cholera, I think, usually, unless you expose yourself in some of the ways that have been mentioned. Having done this, give yourself plenty of fresh air and build up your systems to the resisting power.

The State Board of Health issues pamphlets on the restriction of these diseases which I will not read to you, but these circulars give you very clear and proper directions how to disinfect the bowel discharges, for instance, and the directions to householders and physicians, and the care of the body after death, and so on.

These points are for your local board of health to look after.—"Give public notice of infected places, so that no person may unguardedly take water from sources likely to be infected, and investigate the source. If from a contaminated well, see that measures are taken for boiling the water, or for stopping its use to prevent further cases." "Order and enforce the destroying of all discharges from the bowels; it is safest to disinfect the discharges of all persons affected with diarrhœa; that may be a precursor of cholera or typhoid fever." In times of their prevalence, it is no unusual thing for persons to be affected by diarrhœa which does not reach the stage of cholera, but is simply a mild type of the disease. So with cases of typhoid fever, there are discharges from the bowels from the patients who are not so sick otherwise as to compel them to stay in the house, and yet the discharges from such patients would be equally as dangerous as if they had the disease in severe form. "Disinfect the privy. Order and secure the disinfection of beds that have been soiled by discharges." "Secure the co-operation of the people in preventing the disease." Especial care is needed for its prevention in times of drouth and low water in wells. One reason of that is that the more rope you have to use to get down to the water, the larger will be the area from which drainage will flow; consequently perhaps in some seasons simple surface well waters may not be contaminated, and yet at a dry time it may draw water from two or three hundred feet distant that has passed through some cess pool or out house, or something that will enable it to convey the disease to that water, and thus infect you.

Prof. Fall, Albion: I hardly know what phase of the subject of cholera or typhoid fever to take up, but it has been suggested to me that a few words in the line of handling of bacteria — the germs of disease, might be in order; that you would all be interested in that at least, and allay some of the prejudices which some people have against the so-called "germ theory of disease."

There is an idea that much of this talk about germs is speculative, is theoretical and is not at all practicable; that really the doctors are talking about something they know more about from the standpoint of theory than they do from practice. If I can say something tonight that will make you feel that these germs, which are mentioned always now-a-days in talks like this, are as well understood as potatoes, or buckwheat, or rye, or barley, or boys, or rabbits, then I will have accomplished the one point that I desire to make.

If we could go into any laboratory, you might be shown,—Dr. Vaughan would have brought them here if he had come tonight,—test tubes; this one contains cholera, this one consumption, this one scarlet fever, this one leprosy, and so on to the end of the list of germ diseases. There they are. Living forms, germs that are the specific cause of these diseases. I

remember making a little talk to the ladies of the district convention of the W. C. T. U. down in my district once, and I took down one or two of these test tubes, and as I talked about it I handed them around to the ladies there, but they held them out this way [illustrating], at arms length, and passed them on. But they can be handled in this way with perfect safety. Dr. Vaughan would have shown you them tonight if he had been here, the test tubes with the germs in them. Except by the aid of the microscope or stereopticon, he cannot show you a single germ, because they are too small to be seen with the naked eye, they are so small that it takes the highest power of the best microscope to see them. The only method that we can employ for seeing them by the unaided eye is to produce them in such large quantities that in the aggregate, a great colony of them will take up space enough so they will become visible even to the naked eye; and what we see would be not a germ, but a colony of germs, millions of them in a single drop or particle.

How are these germs handled? Now, if I wanted to study, we will say rye, and suppose I had never seen any, and wanted to study it and make myself acquainted with it thoroughly, I might send away and get a few seeds, and study those, and for fear that amount of material is too small I might sow some of these seeds and give them the proper conditions, and wait until the crop is grown, and then gather a large harvest of the same seed. So if I had a few germs, of a particular kind, and I wanted to study them carefully, I should do the same thing, for your rye seed is vegetable, and so are these germs, and put them in the proper soil in which we know they will grow, and each species will produce a crop exactly like the seed I sow. So the same principle is employed for germs as for grains. I want to know what this plant is, this specific cause for typhoid fever, and I get a few of these germs, and grow a crop of typhoid fever germs, colony after colony of them, and study these colonies.

Now, it is a more particular task to grow a crop of typhoid fever germs than it is a crop of rye or oats, much more; because of the difficulty of isolating, of keeping these particular germs clear from all others. I may send away and get a pint of rye (I talk about rye all the time, let us talk about wheat awhile.) I can send away and get a pint of wheat that will be warranted to be pure wheat, so that when I sow this pint of wheat I shall be sure and get a pure crop. The trouble about these germs is that there are so many of them, and they are so small and light that they float in the air, and, without the utmost precaution, one kind of the germ will be suddenly mixed with the other kind of germs, so that great caution is absolutely necessary.

I find what kind of soil the germ will grow in the best. We have several forms of soil, such as gelatine cultures, beef broth, agar, etc. We boil thoroughly this gelatine or other culture substance until, by the temperature which we have subjected it to, we know that the germs in it are all killed, that it is sterile, that no living germs are there. We have done that boiling while this test tube containing the culture is completely plugged with a cotton ball. Now that roll of cotton is in the test tube, and no germs from the outside can make their way into the test tube, only such as I deliberately introduce into it. I take one of these sterilized test tubes, and I take a platinum wire which is sterilized by burning it in the fire, I dip that into the material containing the germs, and lifting out the cotton quickly thrust the wire and germs down into the gelatine and then put the cotton back. Some germs will grow quickly, in twenty-four hours

I begin to see a little growth there in that culture, and that growth will follow the path of the platinum wire as it was thrust into the gelatine, so I know it is all right. I let them grow for a time, and until the colony is large enough so that I can take the material out and study it under a comparatively low power of the microscope.

Now, by recognizing certain facts and features about the form and peculiarities of this colony, I may make up my mind whether I have the germ in question. How shall I know that this particular germ is the cause of this particular disease? The discovery of the process upon which that might be thoroughly tested and demonstrated is due to the eminent Dr. Koch of Berlin, who, as you know perhaps, discovered the germ of tuberculosis, and he identified the cholera germ,—the comma bacillus, and the connection which it bears to that disease. Dr. Koch established what are now know as Koch's tests. These tests are four in number; four tests by which we may know that any particular germ is or is not the cause of a particular disease. There are four steps. First, the germ is always present in the animal or man suffering from the disease. If it be typhoid fever then material is taken from the alimentary canal. The germs thus found in the diseased person are taken by the methods which I have very imperfectly described to you. A pure colony is obtained, and that is the second test; these germs are cultivated until we get a colony just alike in every particular and which therefore shows that it contains but the one germ. The third test is to take a little of this pure culture, and inoculate it into the system of a healthy animal, a white rabbit or a guina pig or a pigeon or a rat, any animal that is susceptible to this disease, that will take the disease as we say, and the animal known to be healthy; that is the third step. If now this germ fails to set up in this animal the same disease which the person from which this material was taken was affected with, then it has gone astray. If the same symptoms accompany it in the animal as in the person from which it was taken, then we are convinced by the third step that we have in hand the disease germ. The fourth step is to obtain now from the body of this inoculated animal these same germs and by the process of culture and microscopical examination recognize them to be the same germs. Once then you put a germ through these four tests,—obtaining a pure culture, producing the same disease in a healthy animal, recovering the germs from the animal, we are then certain that the germ in question is associated with the disease. That has been done so satisfactorily that it takes the discussion out of the realm of the improbable or illogical and places it in a very practical realm. So that what we read about germs is based upon just as certain facts as that we raise our crop of rye, or wheat, from the seed rye or seed wheat which we put into the ground. I say this in order to create confidence in all our minds in the statements of those who are well informed and who are to be our teachers on these subjects which pertain to life and death; that we may read their statements with confidence and follow their directions, and if we follow them carefully we shall save ourselves from disease, and by this many lives may be saved.

Mr. Wicks, Stanton: Did I understand the professor correctly in saying these germs were a plant life?

Prof. Fall, Albion: Yes. But that is a very difficult question. It is one of the profoundest questions in biological research, to determine whether certain substances are animal or vegetable in their nature. But it is pretty well settled now that these disease germs are vegetable in their

nature. Some are subjects of discussion among biologists, but we know that some of them act like vegetables rather than like animals. They are alive, and in the system are doing a great deal of harm, producing disease and death.

The last paper of the evening and of the convention was by Mr. Willitts, of Lansing, and was as follows:

ACHIEVEMENTS OF SANITATION MEASURED BY VITAL STATISTICS.

BY GEORGE E. WILLITTS, LANSING, MICHIGAN.

The carnage of a Waterloo or a Gettysburg, where a third of a vast army is destroyed on a single battle field, shocks us, and awakens a spirit of humanity and fraternity which triumphs over prejudice and hatred; and we are constrained to exclaim, "Let us have peace." Peace! philosophers have dreamed of it, poets have sung of it, and philanthropists have worked for it; and the thought is surely growing, that the brotherhood of nations should not engage in deadly combat. Enlightened students of sociology confidently look forward to a time when differences between nations shall be settled by an appeal not to arms, but to international law. They look for a time when the world shall be truly civilized, and the awful carnage of war and its concomitant suffering and sorrow shall cease.

Surely this is "a consummation devoutly to be wished"; but how insignificant is the destruction of life by war, when compared with the destruction of life caused by those great epidemics of disease, such as the Black Death, which have spread uninterruptedly throughout the world, entirely depopulating city after city, and striking down from a fourth to a half of nation after nation. Hecker, in his history of the Epidemics of the Middle Ages, says that the Black Death depopulated not less that 200,000 towns and villages in Europe, in one visitation. In one outbreak in the city of London it destroyed over 100,000 people. In many places in France not more than one in ten was left alive. Only one-fourth of the people of Venice escaped alive and, fleeing, left that proud city a horrible morgue of desolation. Hecker estimated that by this visitation of Black Death, 25,000,000 of the people of Europe were destroyed.[1] In Cairo, Egypt, from ten to fifteen thousand died each day. Of the inhabitants of Caramania and Cæsarea none were left alive. In China alone 13,000,000 people died in this epidemic, and it is said that India was depopulated.

We who have never experienced such an epidemic cannot comprehend it. If such a loathsome plague as the Black Death should break out in this country, and in each of our metropolitan cities from ten to twenty thousand people should die daily, and thousands and thousands of villages and cities should be desolated and whole States should become depopulated, what consternation would seize the public mind! But how much more such a calamity affected the ignorant peoples of the Middle Ages, who had no knowledge of sanitation, and no reliable means for arresting the spread of the disease. So great was the dread of this loathsome and mortal dis-

[1] Some place the number as high as 40,000,000. Hecker evidently considered 25,000,000 a very low estimate. His calculations are based on the supposition that, at this appearance of the Black Death (1348) the entire population of Europe was 105,000,000, or only one-half of what it was at the time he wrote (1832), which is perhaps too low an estimate.

ease, that it overcame the strongest natural ties,—parents deserted their stricken children, and children fled from their afflicted parents, husbands forsook their wives and wives their husbands, at the appearance of the first symptoms of the deadly disease.[1]

But experience is a great teacher, and fortunately for us, we have inherited the benefits of the race experience with these calamities, and many of them, which in former times swept over the world, each like an irresistible demon, utterly baffling all human efforts, we are now able to bring largely or wholly under control. During this epidemic of the Black Death in Europe, it was observed that those persons who kept entirely away from the sick, and from every person or thing that had been near the sick, escaped the disease. Thus arose the idea of isolating the sick from the well, which has developed into such a powerful weapon for combatting the dangerous communicable diseases. It was also during this epidemic that fumigation came into considerable repute as a means for destroying the contagium and thus restricting the spread of the disease, though I am unable to learn that sulphur was generally used. It was also during this fearful ordeal that some people came to see that filth and bad ventilation invited the disease, and that good ventilation and cleanliness helped to prevent the disease. These sanitary measures—isolation, disinfection, and cleanliness—were the most important means by which the Black Death, which ravaged Europe during four centuries, was at last completely subdued.

The Black Death is not the only great scourge which has been driven out of Europe by sanitation. Leprosy, the sweating sickness, and petechial fever have been practically banished by this modern Hercules; and the ravages of many other diseases, such as cholera, small-pox, consumption, diphtheria, typhus, typhoid and scarlet fevers, have been very greatly reduced.

I have frequently searched for a compilation of death rates, from some of the principal diseases, reaching back through a long period of time so as to tell a connected story concerning such diseases; and not having been able to find anything satisfactory, I have undertaken to do something in this direction myself. Part of the result is some diagrams which I shall present this evening.[2] The diagrams relate principally to London, England, as that city contains the largest population for which reliable data could be obtained during so great a period of time

Fevers.—This diagram (No. 1.) exhibits the average annual number of

---

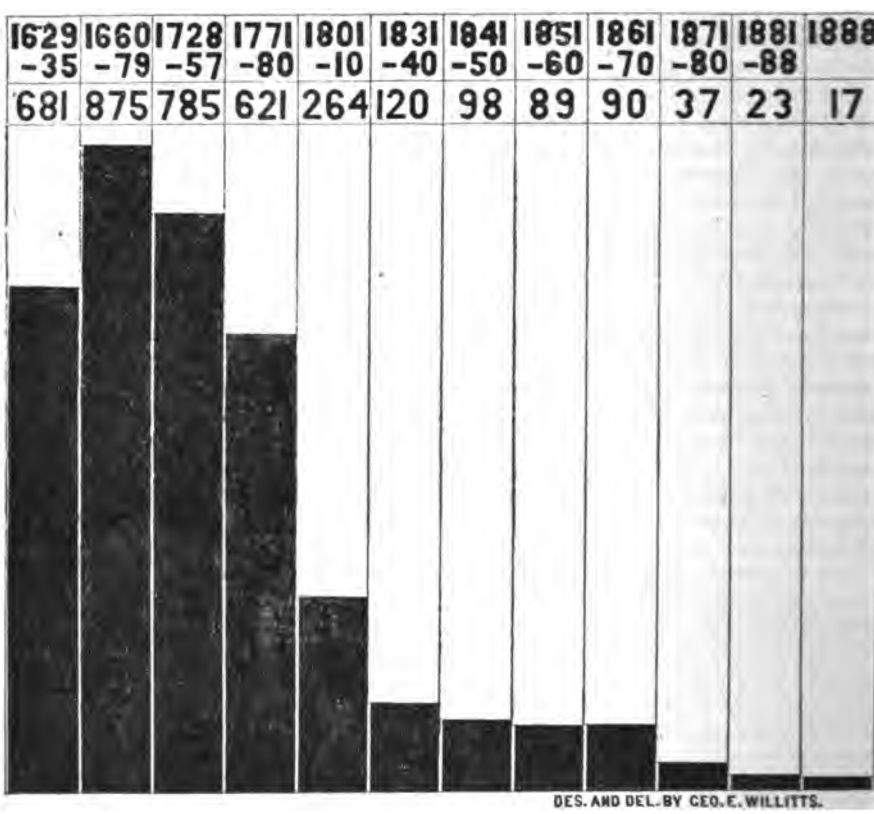
[1] "It was an oriental plague, marked by inflamamtory boils and tumors of the glands, such as break out in no other febrile disease. On account of these inflammatory boils, and from the black spots indicatory of a putrid decomposition, which appeared upon the skin, it was called in Germany and in the northern kingdoms of Europe, *the Black Death*, and in Italy, *la Mortalega Grande*, *the Great Mortality*. * * * The imperial author, Cantacuzenus, whose own son Andronicus, died of this plague in Constantinople, notices great imposthumes of the thighs and arms of those affected, which, when opened, afforded relief by the discharge of an offensive matter. Buboes, which are infallible signs of the oriental plague, are thus plainly indicated, for he makes separate mention of smaller boils on the arms and in the face, as also in other parts of the body, and clearly distinguishes these from the blisters, which are no less produced by plague in all its forms. In many cases, black spots broke out all over the b dy, either single, or united and confluent. * * * The fauces and tongue were black, and as if suffused with blood; no beverage would assuage their burning thirst, so that their sufferings continued without alleviation until terminated by death, which many in their dispair accelerated with their own hands. In the west, the following were the predominating symptoms on the eruption of this disease. An ardent fever, accompanied by an evacuation of blood, proved fatal in the first three days. * * * In Egypt inflammatiom of the lungs was predominant, and destroyed quickly and infallibly, with burning heat and expectoration of blood."—The Epidemics of the Middle Ages. From the German of J. F. C. Hecker, M. D. * * * Translated by B. G. Babington, M. D., F. R. S., etc., London, MDCCCXLIV.

[2] The sources of the data for the diagrams illustrating this paper are given in the foot-notes to the tables (numbered respectively the same as the diagrams) at the close of this article. The headings of the tables are more explicit than those of the diagrams.

deaths from fevers[1] (typhus, typhoid, and simple and ill-defined) per 100,000 population in London, England, in periods representing over two and a half centuries (1629–1888), and shows an immense reduction in the combined death-rate from this class of diseases, it having been over forty times as great in the seventeenth century as at present. Typhus fever, that scourge of the sixteenth and seventeenth centuries, has almost entirely disappeared from London. The specific cause of typhus is undoubtedly a micro-organism, but the conditional causes—those which caused it to spread and become such a formidable disease and such an important cause of deaths in London—were bad ventilation, great over-crowding, and the personal and domestic filth of the people.

NO. I.

ANNUAL DEATHS IN LONDON BY FEVERS (TYPHUS. ENTERIC, ILL-DEFINED) PER 100000 POPULATION



The specific cause of typhoid fever is a micro-organism, called typhoid bacillus, (*bacillus typhosus*) which gains access to the human body most

[1] These fevers were not differentiated in the early periods shown in this diagram.

frequently in drinking water which has become contaminated by the excretions of a previous case of typhoid fever. It is not strange that the people of London had a very high death-rate from typhoid fever when they obtained their water almost wholly from wells, mere holes in the ground, many of which must have received the leachings from carelessly placed cemeteries, and most of which certainly were receptacles for the leachings from surrounding cess-pools and privy vaults which were ever reeking with filthy accumulations.

The causes of death, called "simple and ill-defined fever", were probably largely typhus and typhoid fevers the symptoms simply not being well marked, so that the unsanitary conditions which I have outlined as the conditional causes of typhus and typhoid fevers, are practically the composite, conditional cause of the deaths represented in this diagram (No. 1.). These unsanitary conditions have been gradually reduced by public-health measures, such as the sanitary inspection of houses and premises, tearing down old pest-breeding rookeries, and building well ventilated model tenement houses for the poor, with more open air-space around them; straightening, widening and paving streets; opening out courts and alleys; introducing good systems of public drainage, sewerage and water supply.[1] These public sanitary measures have had a good educational influence on the people, diffusing among them a better knowledge of sanitation, developing in them more rational habits, and leading them to coöperate with sanitarians for sanitary reform. As these improvements in public and private sanitation have arisen, the combined death-rate from typhus, typhoid, and simple and ill-defined fevers has fallen, so that whereas in the seventeenth century this class of diseases killed, per annum, 824 persons per 100,000 population, it now destroys only about 17 per 100,000 each year. This shows a saving of over 34,000 lives per annum in the city of London from this class of diseases by these sanitary improvements.

Consumption.—We have become so accustomed to the presence of consumption that we look upon it as a matter of course, and with about the same equanimity that we observe the recurrence of the seasons; but consumption is nevertheless the most dreadful communicable disease, and has justly been termed the "great white plague." As far back as records of deaths in London are preserved, consumption has led every other cause of deaths. For short seasons cholera or black death claimed more victims, but for any period of ten or twenty years consumption caused far more deaths; and despite the great reduction which has been made in the death-rate from consumption, it still leads every other cause of deaths.

This diagram (No. 3.) exhibiting the average annual number of deaths from consumption per 100,000 population in the city of London in periods representing the seventeenth, eighteenth and nineteenth centuries, shows a very great reduction in the death-rate from this disease, it having been over six times as great in the seventeenth century as it is at the present time.

The specific cause of consumption (*tuberculosis*) is a micro-organism, called the *bacillus tuberculosis.*[2] It most frequently gains access to the body in the air breathed, the air having become contaminated with dry, pulverized sputum from a consumptive patient, the bacilli being found in large numbers in such dust. Consumption has been produced in several

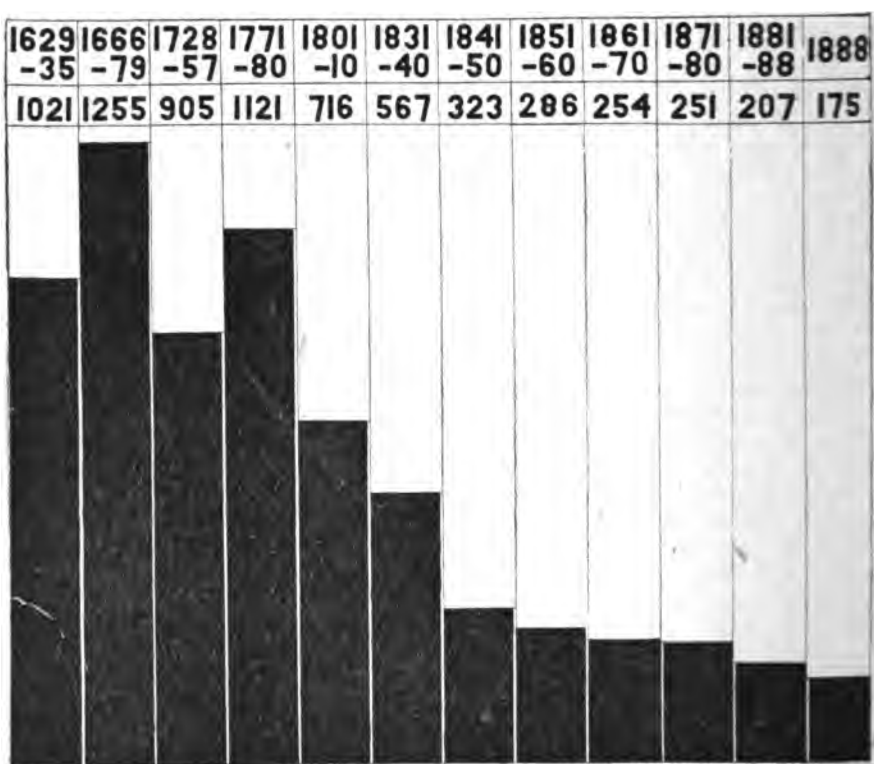
[1] The influence of sewerage and water supply on the death rate in cities. By Erwin F. Smith.

[2] Discovered by Koch, the discovery having been first announced March 24, 1882. Sternberg, *op. cit.*, pp. 343-392.

kinds of the lower animals, such as dogs and guinea-pigs, by causing them to breathe air containing the pulverized sputa of consumptives. Dr. Gautier, a French physician, accidentally breathed this sputum dust, while experimenting, and thus contracted consumption. When Tappeiner was experimenting on dogs, by placing them in a room where the air was charged with the pulverized sputa of consumptives, a robust servant, of about forty years. more ignorant than brave, did not believe the disease could be contracted in that way, and, disregarding all warnings, went into the inhaling room. Fourteen weeks after this exposure he died of consumption.

NO. 3.

ANNUAL DEATHS IN LONDON BY CONSUMPTION PER 100,000 POPULATION.



When we consider that in the seventeenth century most of the houses of London had no floors but the ground, that over this rushes were thrown, and when one layer became saturated with filth, another layer of rushes was strewn over it, that these hovels were not ventilated, that cuspidors were not in general use, and that the people were in every way extremely filthy,[1] it will be readily seen that in most of the houses this thick carpet

[1] Smith *op. cit.*, pp. 84-5. Macaulay, History of England, Vol. 1, chap. III. Hecker, *op. cit.*, sweating sickness chap. III, sec 4.

of rushes must have been full of the germs of consumption, and the air of the rooms must have been loaded with the tubercle bacilli. It is therefore not surprising that in the seventeenth century there was a death-rate, from consumption, of over 1,200 per 100,000 population.

It will not be difficult to see how the sanitary improvements in London, which I have just mentioned as having reduced the death-rate from fevers, have also greatly reduced the death-rate from consumption. The great improvements of the houses, the more general introduction of cuspidors, and the general introduction of systems of sewerage and water supply have tended to carry the tubercle bacilli of consumptives entirely away from the people. These and supplementary sanitary improvements, including land drainage, etc., have reduced the death-rate by consumption from over 1,200 in the seventeenth century to only 175 at present, per 100,000 population, —indicating a saving by these improvements of about 44,000 (43,944) lives per annum from consumption in the city of London.

Small-pox.—In the seventeenth century, small-pox was not only one of the most loathsome, but also one of the most prevalent and fatal diseases in Europe. It came not as an occasional and transitory visitor, like cholera, but, like consumption, it came to stay, and, like the fabled insatiable Minotaur, grimly exacted its great annual quota of victims, until overcome by the brilliant discovery of Jenner. Macaulay thus vividly portrays the havoc of small-pox in England in the seventeenth century:

"That disease over which science has since achieved a succession of glorious and beneficent victories, was then the most terrible of all the ministers of death. The havoc of the plague had been far more rapid; but the plague had visited our shores only once or twice within living memory; small-pox was always present, filling the church yards with corpses, tormenting with constant fear all whom it had not yet stricken, leaving on those whose lives it spared the hideous traces of its power, turning the babe into a changling at which the mother shuddered, and making the eyes and cheeks of the betrothed maiden, objects of horror to her lover. During the century previous to the discovery of vaccination, small-pox is calculated to have destroyed 45,000,000 of the people of Europe."[1]

In all the victories of man over nature there is none more brilliant and decisive than the prevention of small-pox by vaccination. It stands out boldly as one of the greatest practical achievements of science.

This diagram (No. 4) exhibits the average annual number of deaths from small-pox, per 100,000 population in the city of London, in periods representing the seventeenth, eighteenth and nineteenth centuries, from 1660 to 1888, the periods from 1660 to 1780 being before the introduction of vaccination, and those from 1801 to 1888 being after the introduction of vaccination.

Jenner announced his discovery of vaccination as a protection against small-pox to a friend in the year 1780, but he first published his discovery in the year 1789. In the year 1790 upwards of seventy of the leading physicians and surgeons of London proclaimed their entire confidence in vaccination as a protection against small-pox. Its success was so apparent

[1] The Health Service of a State, by Geo. E. Ranney, M. D., p. 170.

that in 1802 parliament granted Jenner £10,000, and in 1807 it granted him £20,000 more for his services in this discovery.[1]

NO. 4.

ANNUAL DEATHS IN LONDON BY SMALL-POX PER 100,000 POPULATION.

DES. AND DEL. BY GEO. E. WILLITTS.

During the ten years 1771–80, just preceding the introduction of vaccination in London, the deaths, per annum, from small-pox were 502 per 100,000 population, while during the period 1801–10, after the somewhat general introduction of vaccination, the deaths had fallen to 204, or only about two-fifths of what they were during 1771–80; and, as the practice of vaccination became more general, the death-rate from small-pox became more and more reduced, until during the fifteen years 1840–54 the deaths were only 40 per annum per 100,000 population. But there were

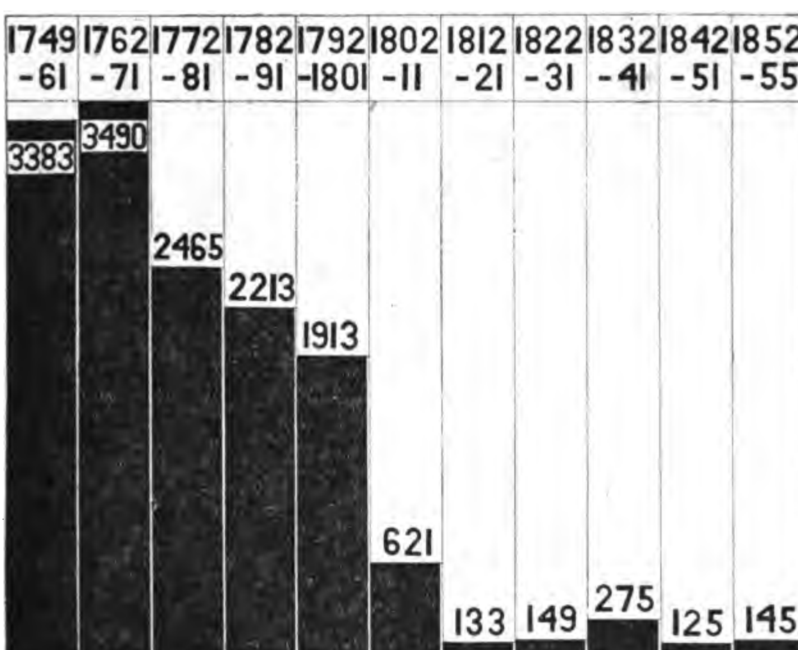
[1] At first Jenner met with great opposition; most people were then "anti-vaccinationists," the learned and the ignorant being equally against vaccination. Learned books and pamphlets were written against it, and the clergy denounced it as an impious and profane attempt to set aside the will of God. It is amusing to note the fears excited in the imaginations of some by the proposition to inoculate people with lymph obtained from a disease in *cattle*. The "bestial humor" thus inoculated into the blood of a human being, it was urged, might produce new and dreadful diseases, or might change man's nature to that of a brute, and it was rumored that persons who had been "*cow-poxed*" were actually growing horns and were going on all fours about the fields, bellowing and bunting like cattle. Rumor even went so far as to give the names and places of persons so afflicted. It is remarkable that, in spite of such opposition on all sides, Jenner's great discovery so signally triumphed within his own lifetime.

some people who did not avail themselves of vaccination, allowing their children to go unprotected, and in the year 1853, a compulsory vaccination act was passed, by which the parents of children who were not already protected by vaccination or by having had small-pox, or who were affected with other diseases which would make the operation dangerous, were compelled, by law, to have their children vaccinated; and during the five year period, 1855–59, the death-rate from small-pox dropped to 23.5 per 100,000 population. In the ten years, 1860–69 it rose to 28, and during the five years, 1870–74, it rose to 66, when it was discovered that the protection in those persons who had been vaccinated a long time before, was lapsing, and a system of re-vaccination was instituted, since which time the death-rate from small-pox has declined, until in the three years, 1885–88, the deaths were only nine per annum, per 100,000 population. When we consider that in the seventeenth and eighteenth centuries the average death-rate was 436 per 100,000 population, the present reduced death-rate of only 9 per 100,000 population, shows a saving in London of over 18,000 lives per annum from small-pox.

The next diagram (No. 5.) represents, for the kingdom of Sweden, the average annual number of deaths caused by small-pox[1], per 1,000,000 persons living, in eleven periods, during the 107 years, 1749 to 1885.

NO. 5.

ANNUAL DEATHS IN SWEDEN BY SMALL-POX PER 1,000,000 POPULATION.



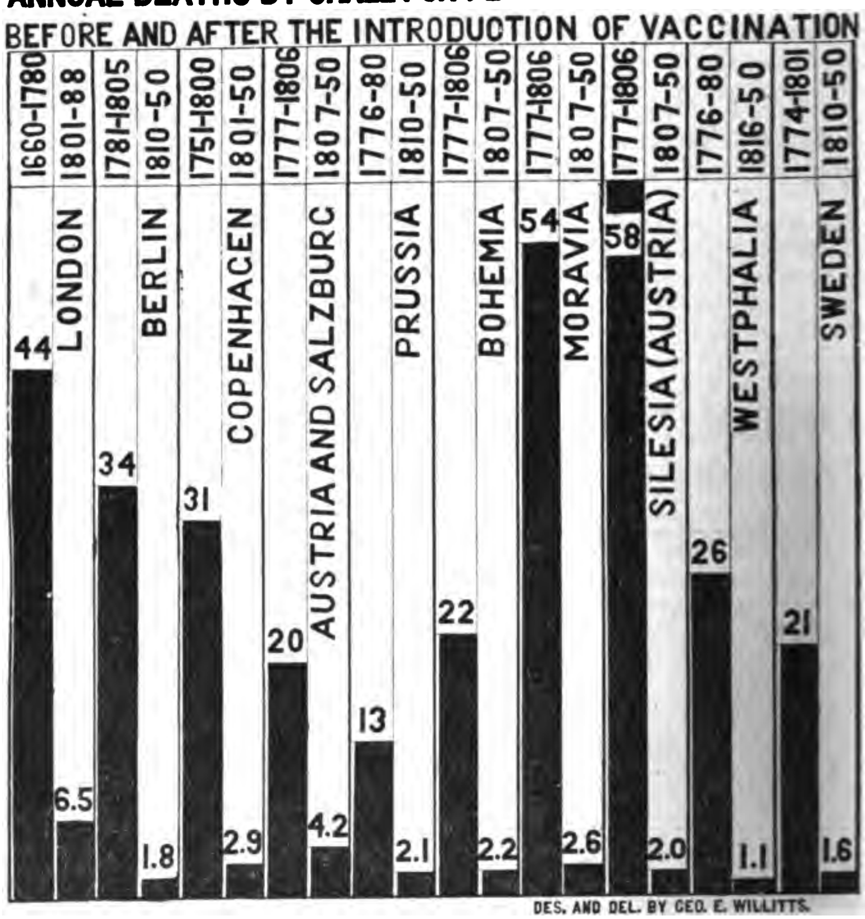
DES. AND DEL. BY GEO. E. WILLITTS.

[1] In the Swedish returns from 1749 to 1773 the mortality from measles was included in the death-rate from small-pox. This, no doubt, accounts for part of the high rate from 1749 to 1771.

Diagram No. 6 represents the approximate average annual number of deaths caused by small-pox, per 100,000 persons living, in various countries and cities during periods before and since the introduction of vaccination. The evidence in these three diagrams (Nos. 4, 5 and 6) should satisfy any person that vaccination is an effectual protection against small-pox.

NO. 6.

ANNUAL DEATHS BY SMALL-POX PER 10000 POPULATION

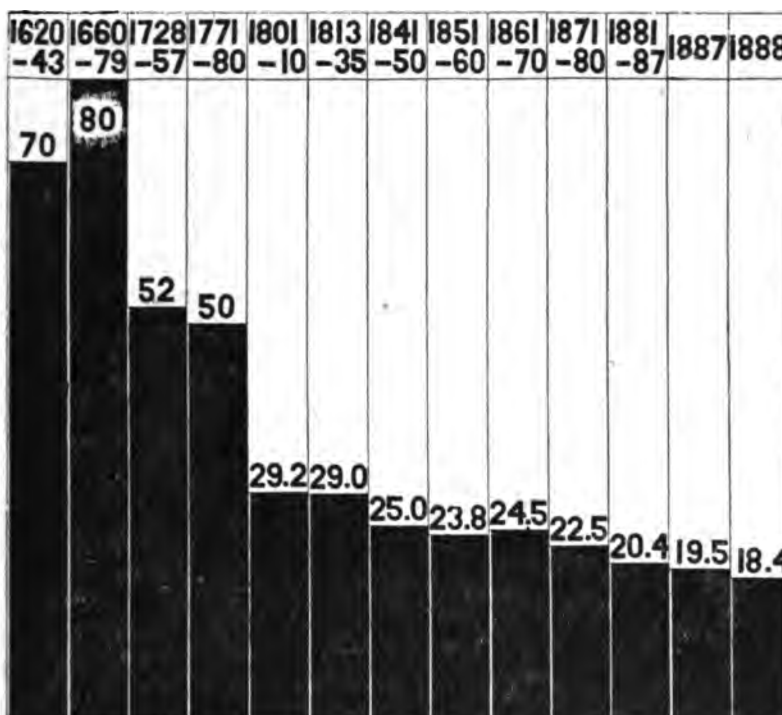


Death-Rate from all Causes.—Thus far I have shown how some diseases which have been the most important causes of deaths have been greatly reduced. But are these genuine achievements? It has been urged by M. Carnot and others that they are only apparent achievements. M. Carnot says, that these lives have been saved from small-pox, only to be killed by some other communicable disease. There is some evidence pointing this way; for the death-rates from bronchitis, measles, whooping-cough, and some of the diseases of summer have been increasing in London. According to M. Carnot the deaths are simply transferred from one disease to another by sanitation; if the fell destroyer is prevented from capturing his victims by one disease, he will capture them by another disease, and the death-rate from all causes will not be decreased.

Here I present a diagram (No. 7.) expressing the death-rate from all causes, per 1,000 population per annum, in London, during twelve periods, representing nearly three centuries, 1620–1888. With the exception of the single period, 1861–70, when, as I have stated, the protective power of vaccination lapsed in persons of middle and advanced ages who had not been vaccinated since their infancy, this diagram shows an uninterrupted decline of the total death-rate (from all causes) since the year 1679.[1] These facts break down M. Carnot's theory.

NO. 7.

DEATHS IN LONDON FROM ALL CAUSES PER 1000 POPULATION PER ANNUM IN PERIODS REPRESENTING THE 17th 18th AND 19th CENTURIES.



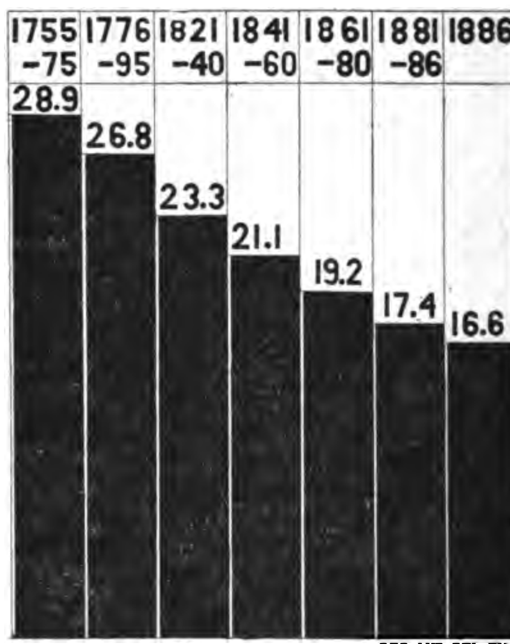
DES. AND DEL. BY GEO. E. WILLITTS.

[1] It has been stated that the death-rate of a people cannot be relied upon for any considerable length of time as an unfailing test and measure of their sanitary conditions: because although the lives of those of earlier ages may be largely saved by good sanitary conditions, ultimately they must grow old and begin to die rapidly of old age, thus causing a rapid rise in the death-rate, and thereafter maintaining a high death-rate. Such a rise as is here suggested might happen, but only temporarily, if all persons in a population were of the same age or nearly so; but in the nature of population this cannot happen, as the children are not so old as their parents, their grand-parents, or their great-grand-parents. If a people accustomed to live to be only 20 years of age on the average, were, by improved sanitary conditions, made to live to be 80 years of age on the average at death, the death-rate throughout the whole population would be only one-fourth what it was when the people on the average lived to be only 20 years of age. By whatever number of years the average age of a people at death is increased, by exactly that number will the death-rate of that people be diminished, and no extention of time can change this law. The death-rate therefore may be relied upon as an accurate measure of the sanitary conditions (natural and artifibial) of a people, throughout any length of time, however great.

I also present a diagram (No. 8) representing, for the kingdom of Sweden, the average annual number of deaths by all causes, per 1,000 living population, in seven periods representing the eighteenth and nineteenth centuries. This diagram also shows a continuous decline of the total death-rate during many years.

NO. 8.

ANNUAL DEATHS IN SWEDEN BY ALL CAUSES PER 1000 POPULATION.



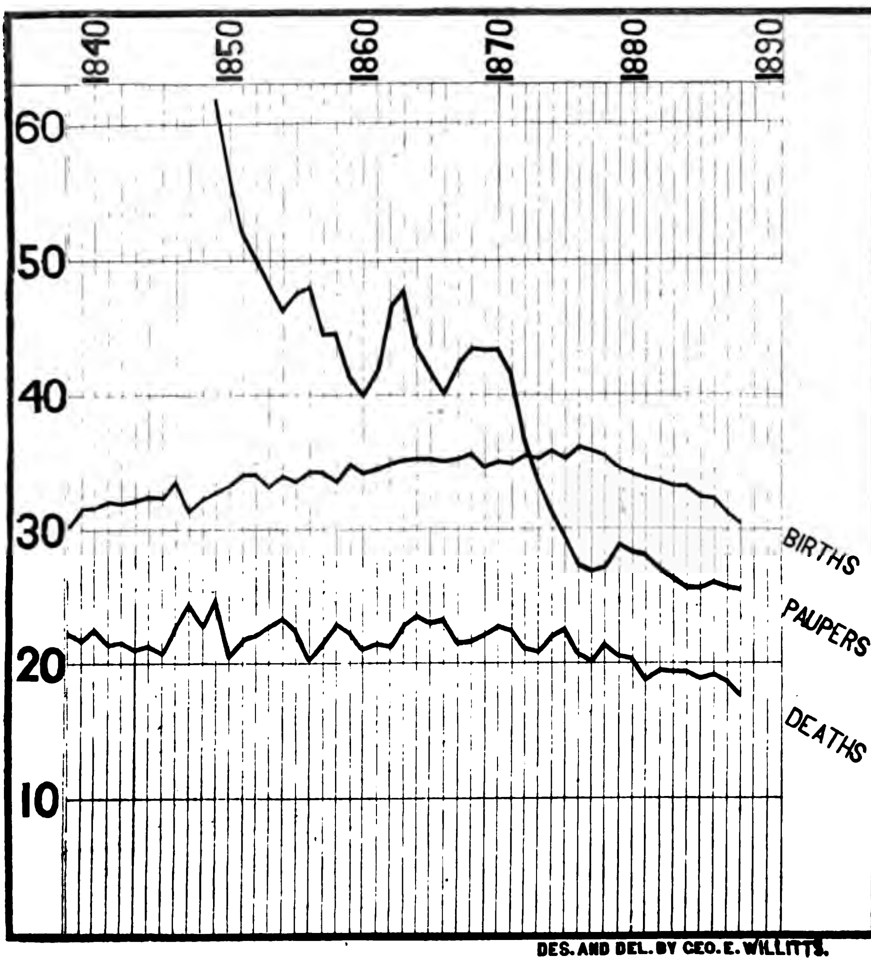
DES. AND DEL. BY GEO. E. WILLITTS.

Doctrine of Malthus.—But there are always objectors, and there is one more very sweeping objection made to sanitation. This objection is drawn from the doctrine of Malthus, that population tends to increase in a geometrical, and the means of subsistence in only an arithmetrical progression. And that, as a result, population constantly tends to press upon the limits of subsistence, and to over populate the world; that disease, war and famine are the great positive checks to over population; and that, if the intellect of man succeeds in saving lives from disease, these will be forced to die in war or by famine. Since the announcement of this doctrine by Malthus, the ablest intellects of the world have been exerted upon it. Macaulay accepted the doctrine; Mill did not accept it, as taught by Malthus; Sadler rejected it altogether; Spencer is rather reserved in his opinions on the subject; Darwin generalized the law,—applying it to the whole animal and vegetable kingdoms, but he considered man, by reason

of his higher intelligence, an exception; Wallace does not consider that the Malthusian doctrine is true, with reference to man.

NO. 9.

NUMBERS OF DEATHS, BIRTHS AND PAUPERS, PER 1000 POPULATION, PER ANNUM, IN ENGLAND.

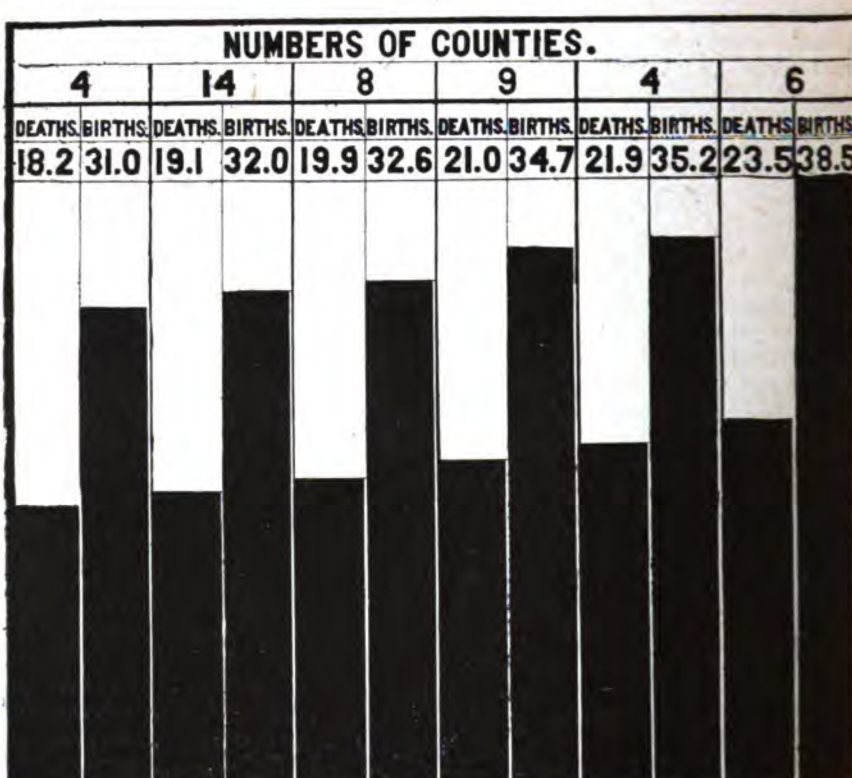


Bearing upon this subject I present two diagrams. The first (No. 9) exhibits, for England and Wales, the curves representing the death-rate and birth-rate during the 51 years, 1838–88, and pauper-rate during the 40 years, 1849–88. From this diagram it may be seen that the birth-rate seems to be falling off in response to a persistent decline in the death-rate. Further, it will be seen that instead of this reduction of the death-rate by improved sanitary conditions tending to crowd the people toward starvation, the pauper rate is actually decreasing.

The next diagram (No. 10) carries the evidence a step further. It represents the numbers of deaths and births per 1,000 population in England (including North and South Wales) by groups of counties graded according to their *death-rates*, during a period of 30 years, 1851–80. It will be seen that not only do the death-rates in these groups of counties grade gradually upwards, but that the birth-rates also grade upwards in a similar way, and that in those counties where, because of good sanitary conditions, the death-rate is lowest, there also is the birth-rate lowest, and where the sanitary conditions are worst and the death-rate is highest, there also is the birth-rate highest; and the difference between the death-rate and birth rate is greatest in those counties where the death-rate is highest, and the population is increasing least rapidly in those counties where good sanitary conditions have produced the lowest death-rates. One reason for this is that he who takes sufficient forethought to bring about good sanitary conditions will take forethought in other directions and is not likely to contract the marriage relation before he is able to support a family, and he who is reckless in the latter will give little heed to sanitation.

NO. 10.

NUMBERS OF DEATHS AND BIRTHS PER ANNUM PER 1000 POPULATION IN ENGLAND BY GROUPS OF COUNTIES GRADED ACCORDING TO THEIR DEATH-RATES (30 YEARS 1851-80).



DES. AND DEL. BY GEO. E. WILLITTS.

I submit that the evidence presented in these last two diagrams sets aside the Malthusian doctrine so far as it has been applied as a criticism of sanitation. But if, now, we return to the diagram of the total death-rate in London (No. 7), we shall see further reason why the Malthusian doctrine cannot hold as a criticism of sanitation; because this diagram represents not only the death-rate from all diseases but also from all causes, including *war* and *famine*, and yet the *total death-rate* has been undergoing a most remarkable reduction during a period of more than two and a half centuries.

The reason is plain why public-health work, instead of increasing the pressure of population upon the limits of subsistence, tends strongly to relieve this pressure, and to reduce pauperism and prevent famine. For, according to the evidence presented in this diagram (No. 7), about 240,000 lives are annually saved in the city of London by modern sanitary measures. This means that the expense of 240,000 funerals is saved each year, which at the low estimate of $30 each is $7,200,000. For each death prevented there are about 10 cases of sickness prevented. Estimate the duration of sickness at the low average of ten days, and the money lost in wages, doctors' bills, medicine and nursing, at $1 per day, and there is indicated a money saving of $2,400,000. Estimate the future earnings of the 240,000 persons whose lives are saved, at $200 each and this item amounts to $48,000,000 annually. At these very low estimates the indicated annual saving in the city of London by sanitation reaches the enormous sum of $57,600,000,—enough to relieve a considerable pressure upon the limits of subsistence.

Conclusion.—The evidence presented in this diagram (No. 7) means a great deal. The reduction of the *total death-rate* in London from about 75.5 per 1,000 population in the seventeenth century to about 18.5 at present, means, as I have stated, the saving of about 240,000 lives each year in that city with its present population. This means that the average age at death in the seventeenth century was about 13.5 years, while the present death-rate implies, if continued, an average age at death of about 54 years,—that is, at the present death-rate the people of London, on an average, will live to be about four times as old as they did three centuries ago. This great reduction of deaths means an immensely greater reduction of sickness. This diagram demonstrates that a great load of sickness and deaths, with their accompanying pain, suffering and sorrow, has been lifted from the world by the evolution of sanitation. This is surely one of the greatest achievements of science, and, as I believe this is undeniably true, I think you will agree with me, that sanitary science is one of the greatest and most beneficent of all the sciences.

Nor is this all. The past is something of a prophecy of the future. The evolution of sanitation has not ceased. The last death-rate is the lowest recorded. Sanitary science is pressing forward in the full vigor and courage of youth, and seems now almost within reach of still more startling achievements.

This is a prophecy of a good time coming when one can lay out reasonable plans with some confidence that he will live to realize them; when one may reasonably hope that his friends will go on through life to old age with him, and that he will not be prematurely bereft of his loved ones. It is a prophecy of a good time coming when sickness and death with their accompanying suffering and sorrow shall be reduced to the minimum, and when happiness will be something more than a fleeting dream.

APPENDIX.

TABLE 1.—*Exhibiting the average annual number of Deaths, per 100,000 persons living, in London, England, caused by typhus, typhoid, and simple and ill-defined Fevers, in periods representing the seventeenth, eighteenth, and nineteenth centuries.*[1]

1629-35. (7 yrs.)	1660-79. (10 yrs.)	1728-57. (30 yrs.)	1771-80. (10 yrs.)	1801-10. (10yrs.)	1831-40. (8yrs.[2])	1841-50. (10yrs.)	1851-60. (10yrs.)	1861-70, (10yrs.)	1871-80. (10yrs.)	1881-88. (8yrs.)	1888.
681[3]	875[4]	785	621	264	120[2]	98	89	90	87	23	17

[1] The numbers of deaths in periods up to the year 1835 were taken from Dr. Farr's table ("Vital Statistics: A memorial volume of selections from the reports and writings of William Farr, M. D., D. C. L., C. B., F. R. S.," London, 1885, p. 304); for periods from 1838 forward they were taken from the Reports of the Registrar-General of England.

[2] The number given for the period 1831-40 is the average of the five years 1831-35 and the three years 1838-40 combined—data for two years wanting.

[3] Of this number 45 were attributed to "spotted fever."

[4] Of this number 90 were attributed to "spotted fever."

TABLE 3.—*Representing for London, England, the average annual number of Deaths caused by Consumption, per 100,000 persons living in periods representing the seventeenth, eighteenth, and nineteenth centuries.*[1]

1629-35. (7 yrs.)	1660-79. (10 yrs.)	1728-57. (30 yrs.)	1771-80. (10 yrs.)	1801-10. (10yrs.)	1831-40. (10yrs.)	1841-50. (10yrs.)	1851-60. (10 yrs.)	1861-70. (10yrs.)	1871-80. (10yrs.)	1881-88. (8yrs.)	1888. (1 yr.)
1,081	1,255	905	1,121	716	567	323	286	254	251	207	175

[1] The data for the periods up to 1835 were obtained from Dr. Farr's mortality table, *op. cit.*; the figures for the period 1840-54 were obtained from the first report of the Royal Commission appointed to inquire into the subject of vaccination, p. 88; the figures for the period 1851-60 were compiled from the journal of the Scottish Meteorological Society, July 1874-July 1875, p. 246; the data for the remaining periods were obtained from the Annual Reports (and Supplements) of the Registrar-General of England.

TABLE 4.—*Representing, for London, England, the average annual number of Deaths caused by Small-pox,*[1] *per 100,000 persons living in periods representing the seventeenth, eighteenth, and nineteenth centuries.*[2]

1660-79.[3] (10yrs.)	1728-57. (30yrs.)	1771-80. (10yrs.)	1801-10. (10yrs.)	1831-35. (5yrs.)	1840-54. (15yrs.)	1855-59. (5yrs.)	1860-64. (5yrs.)	1865-69. (5yrs.)	1870-74. (5yrs.)	1875-79. (5yrs.)	1880-84. (5 yrs.)	1885-88. (4 yrs.)
417	426	502[4]	204	83	40	23.5	28	28	66	29	24	9

[1] Source of Data: The data for the periods up to and including 1835 were taken from the mortality table constructed by Dr. Wm. Farr, *op. cit.*; and for the periods from 1840 to 1888 the data were obtained from the Reports of the Registrar-General of England.

[2] General Note on Table 4.—The periods up to and including 1780 were before the introduction of the practice of vaccination, and the periods from 1801 to 1888 were since the introduction of vaccination, though the practice had not become very general during the period 1801-10. Dr. Edward Jenner announced his discovery, of vaccination as a protection against small-pox, to a friend, in the year 1780, but he did not publish his discovery until 1789. In 1790 upwards of 70 of the leading physicians and surgeons of London declared their entire confidence in vaccination as a protection against small-pox; its success was so generally recognized by 1802, that in that year Parliament granted Jenner £10,000, and in 1807 £20,000 more, for his services in this discovery.

In the periods from 1660 to 1780 there was no vaccination; in the periods from 1801 to 1853 vaccination was optional; from 1854 to 1871 it was obligatory, but not efficiently enforced; from 1872 to 1888 it was not only obligatory, but was more efficiently enforced by vaccination officers. The death-rate from small-pox underwent a continuous decline from 1801-60, but during the ten years 1860-69, it rose to 28 per 100,000 population, and during the next five years, 1870-74, it rose to 66, this increase being confined to those adult persons who had not been vaccinated since their infancy, and in whom the protection of vaccination seemed to have lapsed. A more vigorous system of vaccination and *re-vaccination* was commenced in the latter part of the period 1870-74, since which time the disease has undergone a continuous decline.

[3] Dr. Farr gives the death-rate from small-pox for another period, 7 years 1629-35, as 189 per 100,000 population; but he states that this period was "intercurrent between epidemic years."

[4] The death-rate from small-pox was at the maximum, 502 per million, in the period 1771-80, when the practice of *inoculation of small-pox* had become most prevalent, the disease having been spread by those inoculated.

TABLE 5.—*Representing for the kingdom of Sweden, the average annual number of Deaths caused by Small-pox, per 100,000 living population in eleven periods during the 107 years 1749–1855. Compiled from the "First Report of the Royal Commission appointed to inquire into the Subject of Vaccination * * 1889."*

1749-61. (13 yrs.)	1762-71. (10 yrs.)	1772-81. (10 yrs.)	1782-91. (10 yrs.)	1792-1801. (10 yrs.)	1802-11. (10 yrs.)	1812-21. (10 yrs.)	1822-31. (10 yrs.)	1832-41. (10 yrs.)	1842-51. (10 yrs.)	1852-55. (4yrs.)
3,338 [1]	3,490 [1]	2,465	2,213	1,913	621	183	149	275	125	145

[1] From 1749 to 1773 the mortality from measles is included in the small-pox death-rate.

TABLE 6.—*Representing the approximate average annual number of Deaths caused by Small-pox, per 10,000 persons living, in various countries and cities, in periods before and since the introduction of vaccination.*[1]

Periods.		Territory.	Death-rates.	
Before.	Since.		Before.	Since.
121 years, 1660-1780	88 years, 1801-1888	London	44	6.5
25 " 1781-1805	41 " 1810-50	Berlin	34	1.8
50 " 1751-1800	50 " 1801-50	Copenhagen	31	2.9
30 " 1777-1806	44 " 1807-50	Austria and Salzburg	20	4.2
5 " 1776-1780	41 " 1810-50	Prussia	13	2.1
30 " 1777-1806	44 " 1807-50	Bohemia	22	2.2
30 " 1777-1806	44 " 1807-50	Moravia	54	2.6
30 " 1777-1806	44 " 1807-50	Silesia (Austrian)	58	2.0
5 " 1776-1780	35 " 1816-50	Westphalia	26	1.1
28 " 1774-1801	41 " 1810-50	Sweden	21	1.6

[1] The data for London was derived from table 3 of this article; the data for the rest of this table (6) was derived from a table presented to the Royal Commission on Vaccination by Sir John Simon, K. C. B., F. R. S.

TABLE 7.—*Representing, for London, England, the average annual number of Deaths from All Causes, per 1,000 persons living in periods representing the seventeenth, eighteenth and nineteenth centuries.*[1]

1620-43. (24yrs.)	1660-79. (20yrs.)	1728-57. (30yrs.)	1771-80. (10yrs.)	1801-10. (10yrs.)	1813-35. (23yrs.)	1841-50. (10yrs.)	1851-60. (10yrs.)	1861-70. (10yrs.)	1871-80. (10yrs.)	1881-87. (7yrs.)	1887. (1 yr.)	1888. (1 yr.)
70	80 [2]	52	50	29.2	29.0	25.0	23.8	24.5	22.5	20.4	19.5	18.4

[1] The data for the periods of this table from 1660 to 1835 were obtained from Dr. Farr's table, *op. cit.*, and for the first period 1620-43, the data were obtained from statements of Dr. Farr relative to that table. The data for the periods from 1841 to 1888 were obtained from the Reports of the Registrar-General of England.

[2] This number, 80, includes 12 attributed to "plague," and 13 attributed to consumption. In 1665, a hundred thousand people of London are said to have died of "Black Death." In 1666 occurred the "great fire", which consumed much filth and destroyed many pest-breeding rookeries, and is believed to have otherwise greatly facilitated sanitary progress in London.

TABLE 8.—*Representing, for the kingdom of Sweden, the average annual number of Deaths by All Causes, per 1,000 persons living, in seven periods representing the eighteenth and nineteenth centuries.*[1]

1755-75. (21 yrs.)	1776-95. (20 yrs.)	1821-40. (20 yrs.)	1841-60. (20 yrs.)	1861-80. (20 yrs.)	1881-86. (6 yrs.)	1886. (1 yr.)
28.9	26.8	23.3	21.1	19.2	17.4	16.6

[1] The data for the periods up to 1850, in this table, were obtained from a table in the First Report of the Royal Commission appointed to inquire into the subject of vaccination, p. 86. The data for the rest of the periods were computed from Table 46, Fiftieth Annual Report of the Registrar-General of England.

TABLE 9.—*Representing the annual number of Births, Deaths and Paupers per 1,000 living population in England; the Births and Deaths being for the 51 years, 1838–88, and the Paupers for the 40 years, 1849–88. Obtained from the Annual Reports of the Registrar-General of England.*

Year.	Rates per 1,000.		
	Births.	Deaths.	Paupers.
1838	30.3	22.4	....
1839	31.7	21.9	....
1840	31.8	22.8	....
1841	32.2	21.6	....
1842	32.1	21.7	....
1843	32.3	21.2	....
1844	32.6	21.5	....
1845	32.5	20.9	....
1846	33.8	23.0	....
1847	31.5	24.7	....
1848	32.4	23.0	....
1849	32.9	25.1	62.0
1850	33.4	20.8	56.7
1851	34.2	22.0	52.4
1852	34.2	22.3	50.3
1853	33.3	22.9	48.2
1854	34.1	23.5	46.4
1855	33.7	22.6	47.7
1856	34.4	20.5	48.2
1857	34.4	21.8	44.6
1858	33.7	23.1	44.7
1859	35.0	22.4	41.5
1860	34.3	21.2	40.1
1861	34.6	21.6	41.9
1862	35.0	21.4	46.7
1863	35.3	23.0	48.0
1864	35.4	23.7	43.8
1865	35.4	23.2	41.9
1866	35.2	23.4	40.5
1867	35.4	21.7	42.5
1868	35.8	21.8	43.6
1869	34.8	22.3	43.4
1870	35.2	22.9	43.5
1871	35.0	22.6	41.6
1872	35.6	21.3	36.9
1873	35.4	21.0	33.9
1874	36.0	22.2	31.5
1875	35.4	22.7	29.7
1876	36.3	20.9	27.5
1877	36.0	20.3	27.0
1878	35.6	21.6	27.3
1879	34.7	20.7	29.0
1880	34.2	20.5	28.4
1881	33.9	18.9	28.2
1882	33.7	19.6	27.2
1883	33.3	19.5	26.5
1884	33.3	19.5	25.8
1885	32.5	19.0	25.7
1886	32.4	19.3	26.2
1887	31.4	18.8	25.8
1888	30.6	17.8	25.6

TABLE 10.—*Average annual numbers of Deaths and Births per 1,000 population in the 45 registration counties of England Graded and Grouped according to their death-rates during the 30 years, 1851–80 (derived from table 11 of this article).*[1]

Registration county.	Rates in each county.		No. of counties grouped.	Rates in groups of counties.	
	Deaths.	Births.		Deaths.	Births.
Surrey	17.76	31.40	4	18.19	30.98
Dorsetshire	18.26	31.08			
Sussex	18.27	31.22			
Westmoreland	18.48	31.28			
Kent	18.78	32.66	14	19.10	32.00
Essex	18.78	32.89			
Hampshire	18.81	31.83			
Rutlandshire	18.83	31.44			
Hertfordshire	18.99	31.81			
Lincolnshire	19.02	32.87			
Herefordshire	19.04	29.65			
Huntingdonshire	19.06	32.92			
Berkshire	19.21	31.29			
Wiltshire	19.27	31.32			
Worcestershire	19.33	34.47			
Suffolk	19.40	32.19			
Somersetshire	19.44	30.74			
Oxfordshire	19.49	32.52			
Cambridgeshire	19.50	32.69	8	19.89	32.60
Buckinghamshire	19.57	33.35			
Middlesex	19.63	31.42			
Devonshire	19.87	30.44			
Shropshire	20.07	31.81			
Bedfordshire	20.09	34.20			
Gloucestershire	20.14	32.01			
North Riding	20.26	34.90			
Cornwall	20.57	33.61	9	21.00	34.65
Norfolk	20.61	31.47			
Northamptomshire	20.66	35.44			
Monmouthshire	20.99	36.99			
Derbyshire	21.11	36.34			
Leicestershire	21.14	35.93			
Nottinghamshire	21.21	36.06			
South Wales	21.25	35.98			
North Wales	21.45	31.02			
Warwickshire	21.71	37.06	4	21.92	35.22
Cheshire	21.84	35.11			
East Riding	21.02	34.71			
Cumberland	22.11	34.03			
Staffordshire	22.68	41.38	6	23.47	38.53
Durham	22.76	42.33			
Northumberland	22.88	36.76			
London	23.16	34.84			
West Riding	23.97	38.03			
Lancashire	25.44	37.35			

[1] The counties are arranged in this table according to their death-rates, beginning with the county having the lowest death-rate and following it with the county having the next higher death-rate, and so on, to the county having the highest death-rate, allowing the birth-rates to fall as they may. Then the counties thus graded are grouped as follows: All counties having death-rates falling between 17.50 and 18.50 are grouped together; and all between 18.50 and 19.50 are put in the next group; and all between 19.50 and 20.50 are included in the next group, and so on through the 45 registration counties, except that the last two counties, West Riding and Lancashire, each having a very high death-rate, separating them from the other groups and from each other, were included with the next group below, thus making the average for the last group differ from the next lower by considerably more than a unit. This table is illustrated by diagram No. 10.

TABLE 11.—*Average numbers of Deaths and Births per 1,000 population in each of the 45 registration counties of England during each of the ten-year periods, 1851-60, 1861-70, 1871-80, and during the 30 years, 1851-70; compiled from the Supplements to the Annual Reports of the Registrar-General of England.*

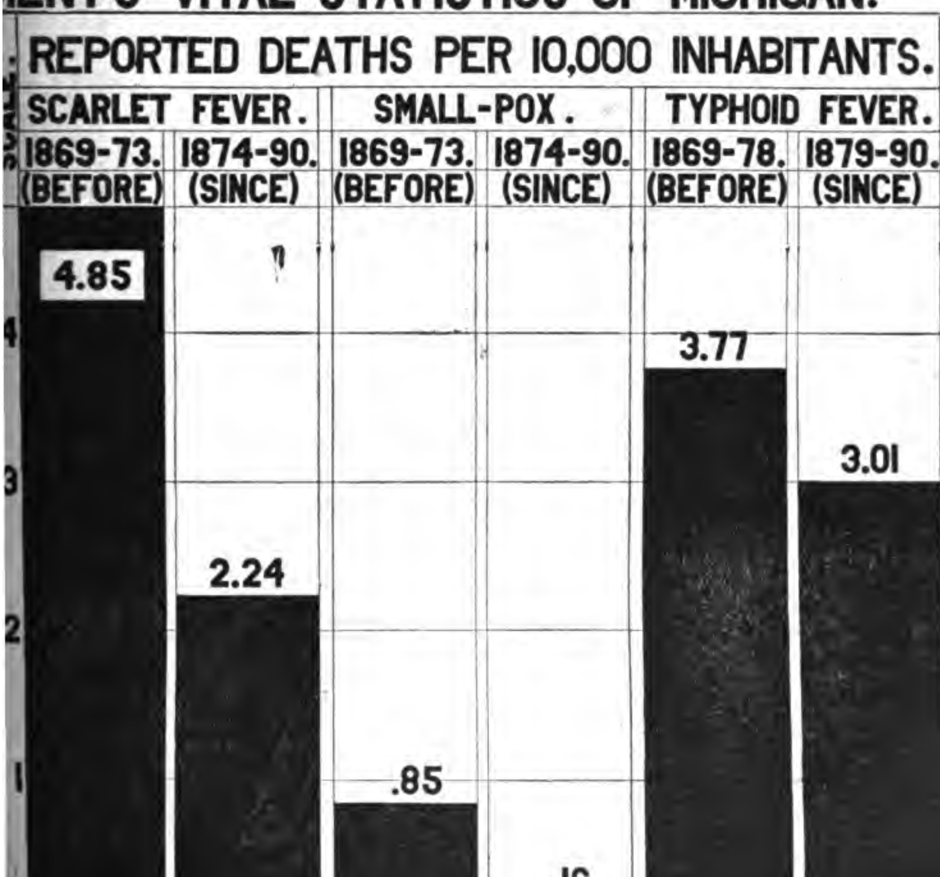
Registration county.	Av. annual death-rates.				Av. annual birth-rates.			
	1851-60.	1861-70.	1871-80.	1851-80.	1851-60.	1861-70.	1871-80.	1851-80.
London	22.49	24.5	22.5	23.16	33.72	35.4	35.4	34.84
Surrey	17.67	18.7	16.9	17.76	30.31	32.7	31.2	31.40
Kent	18.63	19.3	17.9	18.78	31.39	33.9	32.5	32.60
Sussex	18.81	18.8	17.2	18.27	29.65	30.9	30.1	30.22
Hampshire	19.02	19.1	18.3	18.81	31.88	31.4	31.2	31.38
Berkshire	19.72	19.8	18.1	19.21	30.16	31.9	31.8	31.29
Middlesex	19.98	20.5	18.4	19.63	30.17	32.0	32.1	31.42
Hertfordshire	19.47	19.1	18.4	18.99	31.34	32.1	32.0	31.81
Buckinghamshire	19.81	20.3	18.6	19.57	33.24	33.8	33.0	33.35
Oxfordshire	19.66	19.9	18.9	19.49	33.07	32.9	31.6	32.52
Northamptonshire	21.37	21.0	19.6	20.66	36.13	35.4	34.8	35.44
Huntingdonshire	18.67	20.1	18.4	19.06	33.77	33.4	31.6	32.93
Bedfordshire	20.17	20.7	19.4	20.09	33.80	35.3	33.5	34.20
Cambridgeshire	19.50	20.3	18.7	19.50	33.08	32.7	32.3	32.69
Essex	18.64	19.6	18.1	18.78	32.38	32.9	33.4	32.89
Suffolk	19.71	19.7	18.8	19.40	32.08	32.4	32.1	32.19
Norfolk	21.02	21.1	19.7	20.61	31.62	32.0	30.8	31.47
Wiltshire	20.01	19.3	18.5	19.27	31.26	31.6	31.1	31.32
Dorsetshire	18.68	18.7	17.4	18.26	31.83	31.7	29.5	31.01
Devonshire	19.71	20.3	19.6	19.87	30.13	31.3	29.9	30.44
Cornwall	20.40	21.0	20.3	20.57	33.74	33.9	30.2	32.61
Somersetshire	19.63	19.6	19.1	19.44	30.52	30.7	31.0	30.74
Gloucestershire	19.51	21.1	19.8	20.14	31.23	32.3	32.5	32.01
Herefordshire	19.12	19.8	18.2	19.04	29.75	30.4	28.8	29.65
Shropshire	21.12	20.3	18.8	20.07	31.43	32.8	31.2	31.81
Staffordshire	21.94	23.5	22.6	22.68	41.65	41.1	41.4	[illegible]
Worcestershire	18.78	20.2	19.0	19.33	34.30	34.8	34.3	[illegible]
Warwickshire	20.43	22.7	22.0	21.71	37.07	36.6	37.5	[illegible]
Leicestershire	19.62	22.0	21.8	21.14	34.77	35.8	37.2	[illegible]
Rutlandshire	19.09	19.0	18.4	18.83	32.93	30.7	30.7	[illegible]
Lincolnshire	19.36	19.1	18.6	19.02	33.01	33.0	32.6	[illegible]
Nottinghamshire	20.54	21.7	21.4	21.21	37.09	34.2	36.9	[illegible]
Derbyshire	21.03	21.6	20.7	21.11	35.22	36.0	37.8	[illegible]
Cheshire	21.73	22.6	21.2	21.84	34.44	35.6	35.3	[illegible]
Lancashire	23.71	27.2	25.4	25.44	36.76	38.1	38.7	[illegible]
West Riding	23.60	24.9	23.4	23.97	37.59	38.1	38.4	[illegible]
East Riding	21.85	22.7	21.5	22.02	34.22	34.5	35.4	[illegible]
North Riding	20.27	20.5	20.0	20.36	34.29	33.9	36.5	[illegible]
Durham	20.98	23.3	24.0	22.76	41.10	42.0	43.9	[illegible]
Northumberland	22.18	23.5	22.8	22.83	35.09	37.0	38.2	[illegible]
Cumberland	22.42	22.3	21.6	22.11	32.77	34.1	35.2	[illegible]
Westmoreland	19.75	18.0	17.7	18.48	32.53	30.2	31.1	[illegible]
Monmouthshire	20.26	21.8	21.9	20.99	36.76	36.3	37.9	[illegible]
South Wales	21.16	21.4	21.2	21.25	35.85	35.7	36.4	[illegible]
North Wales	22.25	21.5	20.6	21.45	29.96	31.7	31.4	[illegible]

Dr. H. B. Baker, Lansing: I had no thought of discussing this [illegible] but, if you will bear with me, I will try to continue the subject [illegible] standpoint a little nearer home than London or Sweden.

There has been distributed in the audience this evening a num[illegible] documents showing some of the results of researches in this St[illegible] similar direction. I presume that few of you received this par[illegible] diagram, (page 115.) but I have found one here which shows the re[illegible] in the deaths in Michigan by scarlet fever before and since work h[illegible] done in this State for its restriction. In 1873, when the State B[illegible] Health was established, nothing worthy of mention was being done,

LIVES SAVED BY PUBLIC-HEALTH WORK.

COMPARISON OF DEATH-RATES IN MICHIGAN FROM SCARLET FEVER AND SMALL-POX BEFORE AND SINCE THE STATE BOARD OF HEALTH WAS ESTABLISHED AND FROM TYPHOID FEVER BEFORE AND SINCE ITS RESTRICTION WAS UNDERTAKEN BY THE STATE BOARD. COMPILED FROM STATE DEPARTMENT'S "VITAL STATISTICS" OF MICHIGAN.



been done, for the restriction of scarlet fever. Some physicians believed it to be a dangerous communicable disease; a number of physicians did not believe that; but in 1873 the State Board of Health was established, and one of its first lines of work was to teach the belief that scarlet fever was a preventable disease. The State Board of Health was violently attacked by one of the leading physicians who was afterwards president of the American Medical Association. Columns were written and published in newspapers against the State Board of Health for taking that ground. The State Board of Health kept at work trying to teach the people of this State that scarlet fever was a dangerous communicable disease; and one of its methods of teaching was by pamphlets such as were distributed in this audience last evening. The State Board soon found the best way of distributing these pamphlets. They put them in the hands of the local health officers, and asked them to distribute them *to the neighbors of the persons sick*, and the State Board soon found that was the way to undermine the opposition. And the people of this State now know that it is a dangerous communicable disease. Now turn to the statistics, collected by the same method now as before the State Board of Health was established, not all deaths are collected now, but about the same proportion of the deaths that occured are collected now as then,—let me give you the result. From 1869 to 1873 the average deaths per 10,000 inhabitants in Michigan was 4.85; at the close of 1887, after this work had been done which I have briefly outlined, the deaths per 10,000 were only 2.45. Since 1887 it has been still less, so that from 1874 to the close of 1890 it was only 2.24, that is to say, the death-rate from scarlet fever since the State Board of Health has been established is not quite one-half what it was before. One-half of the deaths by scarlet fever in Michigan have disappeared, and the time it disappeared is co-existent with the time that this work has been going on; I think it is due to the work which has been done.

This same diagram has on it the records from the State Department showing the deaths from small-pox before and since the establishment of the State Board of Health, because that was one of the diseases with which the State Board of Health grappled almost immediately on its creation in 1873. The reduction of small-pox has been very much greater than the reduction of scarlet fever. I think that is because we have additional means for its prevention. We can vaccinate for small-pox; that cannot be done with scarlet fever. The records show that before this line of work the death-rate was .85, and since the work has been done .19; or from 1874 to the close of 1890, .16 per ten thousand; less than one-quarter as much since that work has been done as before.

In this same diagram are the figures relative to typhoid fever; the method of its prevention was not known at the time the State Board was established, or at least not definitely; but in 1879 or 1878 the State Board of Health started on the same line of work with reference to typhoid fever that had been so successful with scarlet fever, and the pamphlets have been used in the same manner; that is, distributed to the neighbors of the persons sick with typhoid fever. The reduction in the death-rate has not yet been so marked as in the other diseases, but there has been a very considerable reduction. Before the work for its restriction, it was 3.77, since then ending with 1890, it has been 3.01. Multiply the difference between the two by the times that 10,000 is contained in the 2,000,000 and more of people here in Michigan, and you will find that more than one hundred

lives are being saved in Michigan in each year, which, I assume, without that work would have been lost.

Thus you will see the reasons why I think we are able to point to some achievements in Michigan for which we ought to be profoundly grateful.

Mr. W. H. Owen, Stanton: I believe that catarrh is quite a prevalent disease, and I would like to know whether it is a germ disease, and if so, how communicable and how preventable?

Dr. Baker, Lansing: I do not know that any one can answer that. I might state my belief. I believe firmly, as was explained to you I think last night by Dr. Gamber, that the micro-organism on this side, the right-hand group (See Fig. 8, page 27), or the chain coccus further on (See Fig. 5, page 26), is at the bottom of nearly all of the inflammations of the nose and air-passages, where pus is formed. These micro-organisms are very generally scattered about, and wherever a broken surface furnishes them a resting place they reproduce their kind under varying conditions. There are so many micro-organisms that flourish that no one has so far said that this one is the exclusive cause of catarrh. Those, I believe, are the chief ones.—Streptococcus pyogenes (Fig. 5, page 26), and Staphylococcus pyogenes (Fig. 8, page 27), but it is to be hoped you will not remember the names but simply remember the fact that they are organisms that are present wherever pus, commonly called "matter," forms.

Mr. Asa Morse, Stanton: I would like to ask if consumption is an hereditary disease?

Dr. Baker, Lansing: It is believed that persons of certain temperaments, or peculiarities of structure of the skin and mucous membranes, are more prone to have consumption than others; and such modifications of skin or other structures are inherited.

If time permitted, there is an interesting field, which has been cultivated by the Michigan State Board of Health, which might be described. By reason of the sickness statistics that have been worked up in Michigan, there is much known about the causation of this disease—consumption (and of the other diseases that enter by the way of the air-passages), no where in the world has there been gained such an accurate knowledge as we have of this disease, here in Michigan. There is not now time to dwell upon it, but I will say that consumption and those diseases that affect the air-passages prevail here at those times when the air-passages are irritated by the influence of cold dry air. Then the throat is irritated, and this disease, which enters through the throat, is increased in frequency.

Prof. Fall suggests to me that I did not answer the question yet; so I will add a few words, as follows: A tendency to a break in the skin, and, therefore, to the introduction of the disease, is inherited; but the micro-organism which causes the disease is not generally, perhaps never, inherited.

Mr. Baker: I think we ought to have Professor Fall express our appreciation of the work here in Stanton.

Prof. Fall: I have learned for some years at least to always obey Dr. Baker, and if he says say so I must say it.

I assure you that the State Board of Health can say from their hearts their words of appreciation of the interest which you have manifested in sanitary science during this convention. It has been a very agreeable surprise to us, this large audience, and the careful attention you have given, and the interest you have manifested. I came up from the depot this

morning, and got into conversation with a man who said that the sanitary convention was an utter failure, but I learned afterwards that from his particular standpoint it was. He had supposed that there would be quite a large number of physicians from abroad,—had supposed that this convention was a doctors' convention, and he expected to see all the physicians from the surrounding country, and a good many from further away, come to this convention. Now, it is not, and never is; a sanitary convention is not a doctors' convention. These conventions are for the people, and when we go into a town, and people do not turn out and manifest an interest in it we go away disappointed, because our work, toil and sacrifice of time and all this has been thrown away. We feel that it has not been thrown away in Stanton; we are satisfied that seed hás been sown on good ground, and will spring up and bear fruit. I hope that this interest in sanitary science will not cease here tonight, that it will be perpetuated in one form or another; that you will read up on these subjects, that you will call for the publications of the State Board of Health; address a letter to Lansing, and receive a pamphlet of these communicable diseases, or in some other way cause it to bear fruit in a large way in the time to come.

We hope that our coming among you, and the labor of the committee here, and those who have so carefully prepared the papers, will be rewarded by the good work that shall go on in the future.

The President: I wish to say to the members of the State Board of Health and to the other members, and those who have assisted and been present, on behalf of the audience, and on behalf of the city of Stanton, that we have appreciated your presence. We have been interested and edified, and I am sure that we will in the future try and follow the wise and scholarly advice which has been given us. And I hope that in the future you will see that very fine system of sewerage that you have said we should have, and a handsome school house, and a wiser and better mode of living. We are not believers in that doctrine that famine and war are the only methods whereby the surplus of the race can be gotten rid of, and I hope we shall be better sanitarians in the future. We are under very great obligations to you for your kindly presence and wise, thoughtful words that have been given us.

Mr. Chapin: I move that we give a vote of our sincere thanks to this board.

The President: Will the audience express, by rising, their thanks and appreciation of the presence and the work which the State Board of Health have done among us.

This was done, the large audience all rising.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

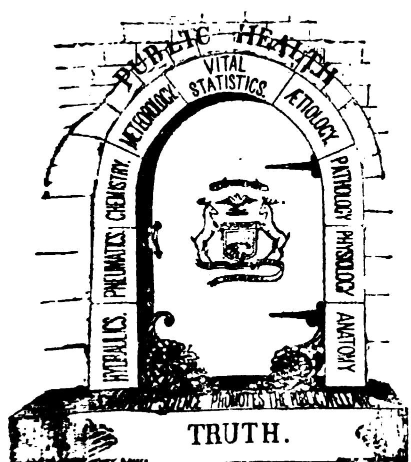
HILLSDALE, MICHIGAN,

JULY 6 AND 7, 1893.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF HILLSDALE.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1894.]

[No. 381.]



MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS,
1893.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

HILLSDALE, JULY 6 AND 7, 1893.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR THE YEAR 1894.

[No. 881.]

Robert Smith & Co., State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

HILLSDALE SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT HILLSDALE, MICH.,

JULY 6 AND 7, 1893.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR 1894.

This Convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Hillsdale, acting with a committee of the State Board of Health.

The following named persons constituted the various committees:

Committee from the State Board of Health.—Prof. Delos Fall, M. S., Albion, and Henry B. Baker, M. D., Lansing.

Local Committee.—L. A. Goodrich, chairman; Frank M. Gier, M. D., secretary; Dr. J. C. Whitney, H. P. Parmelee, W. H. Frankhauser, E. M. Washburn, Seth H. Smith, Prof. C. H. Gurney, F. W. Thompson, S. F. Dwight, Charles A. Shepard, Harry G. Bailey, and Nathan M. Garrett.

Executive Committee.– L. A. Goodrich, Dr. Frank M. Gier, and Dr. Henry B. Baker.

Reception Committe.—The Local Physicians, Dr. R. A. Everett, chairman.

Music Committee.—C. S. Wolcott.

The Officers of the Convention were:—

President.—G. F. Mosher.

Vice-Presidents.—L. A. Goodrich, Hillsdale; Rev. Dr. Ransom Dunn, Hillsdale; Col. E. J. March, Hillsdale; W. H. Bowman, Hillsdale; Dr. D. W. Fenton, Reading; Dr. L. A. Howard, Litchfield; Col. O. A. Janes, Hillsdale; Dr. William R. Ditmars, North Adams; H. C. Blackman, Hillsdale; H. B. Rowlson, Hillsdale; Dr. G. G. Williams, Jonesville; E. B. Gregory, Jonesville; Dr. D. H. Wood, Quincy; Dr. H. D. Wood, Angola, Ind.; and Dr. Duncan McKellar, Osseo.

Secretary.—Frank M Gier, M. D., Hillsdale.

FIRST SESSION, THURSDAY, JULY 6, AT 3:00 P. M.

The Convention was called to order by President G. F. Mosher, and was then opened by prayer by Rev. A. E. Craig. Music was supplied by a vocal quartette, led by Mr. C. S. Wolcott.

ADDRESS OF WELCOME.

HON. L. A. GOODRICH, MAYOR OF HILLSDALE.

Mr. President, Ladies and Gentlemen, and Members of the State Board of Health:

The citizens of Hillsdale are ever willing to welcome all classes of thoughtful and educated people in our midst, and especially when their mission is of such a nature that we can draw and obtain knowledge and inspiration therefrom. We welcome you here today, gentlemen, as teachers in that all-important field, sanitary science. We recognize the fact that you are expending your best efforts in our behalf and welfare, and trying to impress upon our minds the importance of sanitary laws, as well as diffusing knowledge in regard to the origin, the nature, and the prevention of disease, and for the elevation and the prolongation of human life. We recognize the fact that your mission here today is a very important one; and in behalf of the citizens of Hillsdale, I extend to you a most cordial welcome.

RESPONSE, AND STATEMENT OF OBJECTS OF THE CONVENTION.

HON. FRANK WELLS, PRESIDENT OF STATE BOARD OF HEALTH, LANSING.

Mr. President, Ladies and Gentlemen:

If there is any one element that is valuable in a sanitary convention, it is water. Political conventions and other conventions may be—often are—run by wind. Water is something that at a sanitary convention is talked about and thought about, and regarded of more importance than any other one element. Nature today has been quite lavish in her welcome to us, and has furnished us with a goodly supply of this very important element. In addition to that, we are encouraged and pleased by the address of welcome of his Honor the Mayor of Hillsdale. We reciprocate the kind expressions he has used toward us, and we sincerely trust that this convention may prove of interest and of value, and that the educational influences that he speaks of that come from talking together, listening to what you have to say about your local conditions, listening to what the distinguished gentlemen whose names I find on this program have to tell you regarding the laws of health, may be of great profit to you all. When the history of sanitary conventions shall be written, it will be found that Michigan is a pioneer in instituting them. They were first suggested by the Michigan State Board of Health, and have been carried into effect by that organization. Since they were first instituted, some eight or ten years ago, I think, a large number have been held, and

in nearly every place, if not every place, where they have been held, excellent results have invariably followed.

I am asked to state the objects of the convention, and I find them already stated in the program that you hold, and all that I can do is perhaps to emphasize some of them. Sanitary conventions are the natural outgrowth of the great increase in scientific knowledge of the last 25 years. Previous to that time, a convention held for the purpose of promoting the health of a community, as sanitary conventions are, would have been composed almost exclusively of physicians, and instead of endeavoring to point out means to prevent disease, they would have simply considered how to relieve disease after it had already made its appearance. Today, a sanitary convention is composed of citizens generally, come together, as you have, to consider, as you may consider, what you may do to promote the health of yourselves and your neighbors. This knowledge, of which I have spoken, in its relation to disease, is coeval with the discovery of the microscope, which has taught us, by the aid that it gives to our senses, the causes of nearly all, if not all, of the contagious or communicable diseases. By means of the microscope, we have learned that all this class of diseases owe their origin to microscopic organisms which exist in nature, and are reproduced in various ways. Probably these ways may be to some extent explained to you, but at a convention of this kind, this is not of so much importance: it is only important for you to know that they do cause all the various diseases which we call contagious. Typhoid fever, tuberculosis, scarlet fever, diphtheria—all of them familiar to you—all, together with many others, owe their origin to organisms that exist in the water we drink, in the air we breathe, and in the food we eat. Once free these three natural and necessary elements of life form organisms that produce disease, and you stamp out the contagious diseases which are the the cause of possibly two-thirds of the deaths, and a larger proportion of the sickness, of the human family. Emanations of various kinds from the bodies of those sick with these diseases are in some way made to enter the bodies of those well, and there they continue their work. I presume there will be gentlemen here who will explain to you how these organisms work, and how they spread, and it will not therefore be necessary for me at this time, at least, to explain these to you. It is sufficient for you to know, or sufficient for me to state, that if you could make the air and food and water entirely free from these organisms, then conventions of this kind would not be necessary. To reach this point is the ideal condition of human life. Whether this ideal condition shall ever be attained or not, we not know. But we do know that by efforts made by individuals, by knowledge spread through conventions of this kind, steps can be taken towards reaching it. The calling of a sanitary convention of this kind by the citizens of Hillsdale, or of any other community, indicates on the part of such of the citizens who call the convention, an intelligent appreciation of the kind of knowledge that I have endeavored to point out, and it is very creditable to any city, town, or village to desire and promote such a convention. There is nothing that is of more value to humanity than health. Wealth and honors are of small importance, if health is absent. I congratulate you on the fact that you have called this convention, and trust that in its results a long step will be taken towards the securing to the citizens of Hillsdale that brightest jewel, without which all other jewels are of comparatively little value—health.

ADDRESS BY THE PRESIDENT OF THE CONVENTION.

G. F. MOSHER, PRESIDENT OF HILLSDALE COLLEGE.

LADIES AND GENTLEMEN: I do not know but what I should be tempted to explain at the outset that what I have to say will only be what, in the main, occurs to me at the time, and therefore should not properly be designated as an address. I say, I should be tempted to explain that, if I were not sure that you would find it out, as I go on.

I think that any town where a sanitary convention is sitting may feel very much like a drowning man who has a plank thrown to him, or as the starving Russians felt a year ago, when those ships of provision were sent to them, or even as the citizens of Leyden felt, when their friends broke through the army that was besieging them, and carried them food to save them from starvation. Not that we are either drowning or are starving. I think, as a matter of fact, we come much more near to the condition of a besieged community, although we do not realize that the enemy is besieging us. The fact that he is either so very far off, or that we are so blissfully unconscious of his presence, whichever may be the reason for it, or whichever may be the fact, results in the same way. It gives us a sense of security, and we feel as though we were in a safe condition accordingly. Now, if this enemy of disease that is always threatening people is away from this community at the present time, or is not laying the inhabitants of this country under a great burden of anxiety and of affliction at the present time, it is because state boards of health and local boards of health and sanitary conventions have been active—have been doing their work, in various parts of the country. Formerly, as you have been already reminded, in what the President of the State Board of Health has told us, this was far from being true. The most frightful epidemics, the most wasting plagues, the most terrible calamities in their fatality, went freely up and down; and, as they visited especially those localities where people were the most thickly congregated, they claimed their victims by the thousand, sweeping them off in a season more rapidly than a devastating army, although it has its Gatling guns and its Krupp cannon and its repeating rifles, and all of that, would do at the present time; and that even if you go back no further than to the time of the Middle Ages, you take it from the 12th to the 15th and the 16th centuries, along there, and when Europe, or the habitable world at that time, was so frequently devastated by this destructive plague that swept over a country and left broadcast the bleaching bodies and skeletons of those who had fallen its victims—you go back no further than that, and reflect upon the condition of the public in those times, and you would find, I think, that it was quite in keeping, quite in harmony with the condition of medical science and with the knowledge which what you may call the doctors of that time had of the proper or successful ways of combating disease. For, as our improved conditions today are due to the fact that medical science, together with every other science, has been making advancement, has been stepping up and stepping forward, just as every line of education and all lines of morality and the application of all scientific truths to human welfare have been making a similar progress for the last two or three centuries.

I was reading a book the other day that the Scribners have lately pub-

lished, giving some account of the early origin of the universities of Europe; and in that is a chapter—although it is not particularly stimulating nor particularly instructive, I suppose—but notwithstanding, there is a chapter in that that is interesting because it gives what may be regarded as a truthful account of the condition of medical science nearly as for back as the sixteenth century, and the seventeenth century, and from that back in to the fifteenth and fourteenth centuries. The spirit and the condition of medical science of those days were the spirit and the condition of mediævalism; that is to say, everything was under the control of the church; and it was the religious spirit that dominated in matters of medicine, just as it dominated in whatever related to more properly speaking the spiritual welfare of the race; and so, what was the tendency? Why, the natural one that when a man was sick, instead of calling the doctor, the priest was called; and although the monks at that time were the physicians, as a matter of fact, and had all the monopoly, if you please, of medical science, so far as there was medical science during that time, especially in France and in Italy, since those countries seem to be the home of modern medical science, the places of their origin, at least,—even when the monks, who were the doctors, or who were styled as such, were called to examine into the condition of a sick person, they were more likely to prescribe, as a remedy, prayer, a penance, a pilgrimage to some shrine, than they were to feel the pulse and inquire into the condition of the person, and to look at his tongue, and to ask how he had been living, and to inquire as to the condition of the skin, and all that. In other words, it was simply this system of proceeding according to logic, knowing a few rules, and practicing medicine, even, according to those rules, and along with it that habit which you see was natural to the church, and was a praiseworthy thing it also—along with the habit of regarding every calamity, and especially the most serious ones, like the plagues and the epidemics, the cholera, if you please, and the small-pox, and everything of that sort, as a visitation of Providence, coming upon a people because a deity was offended with their behavior, and was so coming to smite them because they had been bad, and punish them for their sins.

Well, now, don't let any modern doctor of medicine straighten himself up and say, "Now, just see what simpletons those priests were, and what an awful thing it was that the church was that bad a teacher;" because I fancy all these physicians are ready to agree with me that the condition of their science was no further advanced at that time than what we would call the condition of spiritual science, or the application of religion, in the true out and out sense, to human welfare was advanced, it being, as I stated a little while ago, a very good and wholesome thing, and medical science, christian science, christianity, everything that was good and wholesome, and of which communities cannot have too much, has advanced from these lower conditions up to higher and better and more promising conditions in which they appear today.

You remember the case of the celebrated German investigator who undertook to write up an account of all the celebrated art galleries and museums in Europe, and the sad thing when he got through with his twenty years of labor and investigation, the thing that startled him the most, was not the fact that there were all of those galleries, filled with such magnificent specimens of painting and sculpture and statuary,

and all those museums, filled with those wonderful things brought from all quarters of the earth, curious and strange in the extreme—but the thing that startled him the most was that every one of those institutions, built as they were of marble, of granite and of precious stone, with costly work and material put into them, but nevertheless had originally rested in a frog pond; only suggesting, in the humorous German way, the fact that everything that pertains to the cultivation of the race, or that works to the development of its æsthetic nature and its higher, finer and grander conditions, has started from these lowly circumstances, and has had to work its way up, first digging in the mud, and removing the stumps, if you please, and getting the old, unwholesome conditions out of the way, then laying the foundations, then, on that, building the superstructure, and then from all the quarters of the earth bringing whatever the human mind can find or invent to grace its nature with.

Well, so medical science has been making its progress, and letting us in this present day witness the glorious condition into which it has come. We speak of the ninteenth century as the wonderful century, and we say, "What a misfortune it is that every one who has lived before cannot be living now, and what a great calamity is going to befall the people in the twentieth century because they will have to look back on us people who live in this nineteenth century, and envy us the wonderful progress we have made, and the interesting condition in which we find ourrelves, with all of these improvements, and with all of these conditions that selate to the comfort and the luxury and the security of life. Now, as a matter of fact, I suppose that the twentieth century is bound to be just as far in advance of the nineteenth as the nineteenth is in advance of the eighteenth, or the seventeenth, or the sixteenth, if you please. The fact that it is bound to be so is found, I think, in the fact that the nineteenth century is in advance, as we well know, of any other century that has preceded it, and that is accounted for by the fact that the human mind cannot be bound in fetters; it cannot be joined to any one condition of mind it has got hold of; all that is good and useful and worthy, it is bound to hold on to. Do you suppose that human intelligence is going to throw away its electric light, and is going to discard the telegraph, and is going to forget how to run a steam engine, and is going to close up its colleges and its schools, and whatever relates to the welfare of the race, and whatever we are in the habit of pointing out as marking the achievements of this nineteenth century? To be sure they are not going to throw them away: they are going to take them along into the twentieth century with them, and they are going to hold on to them, and they are going to make the same kind of improvement in them, as time goes on, that the bright people in this generation, and in the generations that have just preceded us, have been making, with what has been bequeathed to them, and what they have found out by the use of their intelligence, and so on, so that the twentieth century and the twenty-first century are bound to be just as much in advance of this present century as this century is in advance of those that preceded it. And thereby hangs the encouragement for every one who looks forward and contemplates the future of human kind.

Now, all of this condition of human kind that is desirable, and gives a sense of greater security, so far as it relates to the march of devastating diseases, and the visitation of destructive epidemics—all that there is in this present generation that should give us a greater sense of security, as compared with the sense of security that those people have had who lived

in those generations preceding ours, is just as much in harmony with the condition of medical science at the present time as those old and deplorable conditions were in harmony with the less advanced condition of science of that time. You take this country at the present time. What do you suppose the reason is that we are not actually suffering, our large cities, like New York, and Chicago, and Cincinnati, and Detroit, from a devastating epidemic of cholera, like what visited Hamburg last summer? Honestly, now, what do you suppose the reason is that we are not actually suffering from a visitation of that disease this very day? Why is it that we are cheerful and going about our business, and not expecting that when we take up our daily papers, to read that a hundred died of cholera in New York yesterday, and the great fair in Chicago is closed up on account of the devastation of the cholera there, and that it has invaded Michigan, coming by way of Canada, and is destroying people by the score in Detroit--why is it that we are not actually in that condition of fear and of anxiety and of suffering at the present time? Just because, I firmly believe—and I believe also that every one of you will agree with me in it—just because we had an efficient and determined board of health in New York City last summer, that, when those ships came in, laden down, if you may say so, with cholera, stopped the disease there in the harbor, and would not let it land. Suppose those ships had arrived a few generations earlier, or, if you please, one generation earlier, what would be the result? Those cholera-infested passengers would have been landed in New York City, the disease would have had a foothold, and before we would know it we would wake up some morning to hear the death carts rattling along the streets, and to read in our morning paper of the devastation of the disease in New York City, and find it marching steadily across our country, sweeping its swaths of death as it advanced. We do not realize this, I think, so fully as we would if we would calmly consider what it was the state board of health there in New York harbor did last summer. It was only two weeks ago, it seems to me, that I was reading in a paper, I think the New York Independent, a brief statement showing with a few figures what it was that this board of health did, and the statement was something to this effect: that when we realized that every day for about sixty days, that the health officials at New York quarantine practically examined and passed upon the condition of one thousand persons every twenty-four hours, finding many of them perfectly well, others infected with cholera or having already come in contact with it in some way, so that there was danger of their having the contagion about them, and liable to spread it in this country, if they were allowed to land; when we consider that at the rate of a thousand a day they were examining into the condition of people who were so affected, or at least in danger of bringing such an epidemic into our midst, and just remember that they kept it at bay, I think we will agree that it was a disgraceful thing to scold about them, and all that; we kept our patience, and even the city of New York itself kept its patience and didn't scold very much; yet who ever scolded at all about it, was doing a thing that if he had taken a second thought, or if he would think now calmly upon what he did, and upon what the efforts of that board of health actually saved this country from, he would feel ashamed that he scolded even as much as he did. And so I say, it is principally and mainly owing to the work that boards of health have done in our own country, and that they are doing in countries of Europe at the present time,—although they haven't the favorable conditions to work in in Europe that we have here—to their work is due the

fact that so far we have escaped the destructive epidemics so well as we have.

Now, I think, as a matter of fact, boards of health and sanitary conventions, are valuable to us from at least two considerations. They are valuable from what you may call a physical or a commercial standpoint, and that is what touches most of us about as quick as anything. I suppose why the New York people feared a visitation of the cholera last autumn—last summer—was partly on account of its depressing effects on business, and why we in the interior were so extremely anxious that the boards of health, the sanitary officers, whether State or national, in New York and in Chicago and in Montreal and all along, should do their duty, was for fear of the depressing effect that the epidemic would have on business. We know how it was in Hamburg last summer; the presence of the disease closed up the stores, and many a prosperous firm went into bankruptcy on account of the depressing influence of the epidemic turning peoples attention from business, taking their heart away from any interest in the common, every-day commercial life. We know, furthermore—at least, it has interested me to observe, that of ten accounts that I have read within the last four weeks by economists and financiers and statesmen and members of congress and others, bankers, and all of that, who have attempted to explain the present depressed financial condition in which this country is at the present time—of ten, nine of them have stated as one of the important points to be taken into account, the fear that the people had last winter that the cholera would invade this country during the present summer; and so they didn't dare to make the ventures commercially, they didn't dare to place the orders that they usually do place, and to venture on the ventures that they usually made during the winter season, in getting ready for their summer campaign; there was a holding back, and so they didn't dare to put out their money, for fear that the dread disease would come along in the summer, and they wouldn't reap their profits, and so bankruptcy would be the result. You see what the fear of it has done in bringing about, or helping to bring about, at least, this depressed condition in which we find ourselves in this country at the present time. Now, if the fear of it—if the anticipation of it, will do all of that, what would the actual fact itself accomplish? And so I say, I think from this physical, from this commercial standpoint, these sanitary conventions, held, as they are, in our communities, calling our attention to the methods, the reasonable, intelligent methods of keeping back diseases, or keeping ourselves well and clean, and in a sanitary condition, are doing a great deal. They ought to have, not only the countenance, but they ought to have the personal presence of more than we find here at this convention today, to become interested in what they have to tell us, and to stir us up more to look after our own internal and local conditions.

In the second place, I thing these sanitary conventions are interesting, and not only interesting, but extremely valuable, from a moral standpoint. It strikes me as being very appropriate, and something that we may think of with a great deal of interest, that this convention is held here in a Christian church. Some one of the gentlemen who preceded me spoke of the questions that might be considered in conventions of certain sorts; and as he said it, I at once thought of certain conventions that history makes a great deal of, that were held in the earlier ages in the history of Europe, and especially those which were called and known as the great councils of the time, called together by the men foremost in intelligence at that time.

The council was composed, both on the part of those who had arranged the program, and on the part of those who participated in the discussions, those who prepared the papers and then discussed the papers, if you please, similar to the program that we have here—the convention was arranged, and the whole order of business made up, by the men foremost in intelligence in their time; and what do you suppose were the questions that were discussed by two of the most famous conventions of which we have any historical account? One was this, and it was a question which occupied the attention of the council two whole days, and far into the night: "How many human souls can occupy the point of a cambric needle without crowding each other?" That was one. An interesting thing, wasn't it, for men foremost in their time to come together and spend two days and nights discussing, while people were dying all about them by the devastation of what they called the visitation of the wrath of "God coming in the form of a plague, and sweeping away its hundreds and its thousands during every season." And the other question was: "Resolved, that the education of woman is a crime against nature, and a sin against God." And, after about a week of discussion, they succeeded in passing the resolution by a large majority. There was another interesting question, wasn't it? Well, now, when councils are assembled, and conventions like this come together at the present time, they are not considering any such nonsense. They come together to help the human family grow up and be strong and well; and they come together, also, whether it be in a church of the Lord Jesus Christ, or in a public hall, or wherever they may, to take a broader outlook, and see what it is that is afflicting the human race. Is it the wrath of God striking them down in the form of cholera, or whatever may be the disease that comes? Why, yes, and no. It is the wrath of God, just as it always is the wrath of God that visits every person that disobeys and ignores one of his natural laws—the laws of health, the laws of cleanliness, the law that you should breathe good air and eat good food, and keep your whole system in the best condition that you can. You ignore them, and you suffer for it; and you may call it the wrath of God, or your own folly. I think if you call it your own folly you will be treating God more fairly. That is to say, provided any of you are apt to think of God as treating his creatures, whom he loves, in any such a way as that.

Well, now, what I look forward to, and what I believe the twentieth century is going to see, is this; that the doctor of medicine and the doctor of divinity will be regarded as co-evangelists—co-laborers—whether in the church or out of it, working for the salvation of the human soul. Because, the soul, although it be divine and immortal, and must rid itself of the taint of sin before it can be well and sound and strong, nevertheless is in a human frame, and therefore it is a human soul. And when we find today men suffering from the results of their criminal practices, I believe that we just about as much need to send an intelligent physician to visit them as we need to send a priest; and along with the medical adviser we need to send them a spiritual adviser. I do believe there is a good deal of sound common sense in the theory that is coming to the front at the present time, that crime is a disease. I wonder if you would ever find it true that a perfectly well man or a perfectly healthy woman is a wicked man, or a wicked woman? I believe it is nearer the truth to say that the sinner is a sick person, and his crimes are committed because he is sick, and you never will cure him of his crime, or of his tendency to commit crime, until you have cured him of his sickness; that is to say, there is some taint of

the blood; there is some defect of the nervous system; there is some unfortunate physical condition, either inherited or the result of indulgence in some vicious course, that has perverted the system; that has given him what you may be pleased to term a murderous temper; that is, made him quick in the flashes of temper, so that he loses his control, and has given him what you may be pleased to term a bloodthirsty disposition. I believe there is something back of that. You make that man or that woman perfectly sound in body, and you have taken away from him any disposition to hate his fellow man, any disposition to kill his fellow man, and you have taken away from our communities in proportion any need to maintain prisons and jails, and all that sort of thing. We are interested—and I think it is a good thing, and a commendable thing that we are interested—in the saloon evil, and the drink evil, and the intoxication evil, in our communities at the present time. We cannot be too much concerned about it; but I believe we ought to be nearly as much concerned in the condition of our St. Joe river, and of our cesspools, and of our heaps of rubbish and garbage, and our defective sanitary arrangements that we countenance in our communities, even in our very homes,—the fever-breeding and ill health conducing conditions that are to be found more or less in every community. I am glad that Hillsdale is so free from them, but I think if there were in our midst an organization that was setting its heart and its face and all its activities against whatever is unsound as relates to the public health, with the same zeal and the same energy and the same devotion that the Woman's Christian Temperance Union is exercising against the saloon power and against the drink evil, it would be two noble and splendid organizations; and which of the two would be doing the better work for the salvation of the community, I do not know.

Well, now, I think that this sanitary convention is bound to give us some hints, and stir in us some thoughts, and leave with us some suggestions, that if we will we can take to ourselves here in our own community. I am glad that it is not a devastating epidemic that is keeping people by fear or by actual suffering at home this afternoon. I am glad that it is true that we are so secure in our sense of welfare and safety, and that our sanitary condition is so wholesome here in Hillsdale at the present time, that people can go confidently and comfortably about their business, and, if you please, don't need to concern themselves about a sanitary convention; but I tell you it is dangerous to be too secure about such a matter as this. It were better if our business men could come out here and fill these seats; it were better for us if our city government, all of them, were here, along with some of the members that are, and his Honor the Mayor, along with the rest, to get our hearts and our heads and our souls full of what it means to have a convention in our midst that looks to the internal sanitary condition of towns and cities in the State of Michigan. And so, while, as I said, you will find that my remarks have been at random and desultory, I hope that those who come along with these papers that are next on the program will give you something that you can feel has come from persons who have made themselves entitled to our attention by the study and the investigation and the care with which they have thought out all these great questions that are of such exceeding interest.

After music by a vocal quartette, the President announced that a telegram had been received from Dr. Wood, of Angola, Ind., who was to have read a paper on "*Restriction of Cholera and Typhoid Fever*," that by reasons of sickness, he was unable to be present; the President then called upon Hon. Frank Wells, President of the State Board of Health, to discuss the subject. Mr. Wells spoke as follows:—

WHAT IS BEING DONE BY THIS STATE, AND BY THE UNITED STATES IN THE RESTRICTION OF DANGEROUS DISEASES.

BY HON. FRANK WELLS, PRESIDENT STATE BOARD OF HEALTH, LANSING.

MR. PRESIDENT: Not having expected to talk on the subject of what the the State has done or what the United States has done in the restriction of dangerous communicable diseases I made no preparation for that purpose. I have been to some extent connected with the work of the State Board of Health, and possibly, if it would be of interest to the audience, I might state to them something of what has been done in the way of quarantine in this State, and also what has been done in other States, and by the United States.

In April of this year, there was a convention of the State Boards of Health held in the city of New York, to consider the best methods necessary to be taken for the purpose of preventing an inroad of cholera this year. The convention was largely attended by representatives of nearly all the States of the Union. There were also present officers of the U. S. Marine Hospital Service who under a law of Congress are authorized to carry out the provisions of quarantine law; Dr. Jenkins, health officer of the port of New York, members of the State Board of Health of the State of New York, and other distinguished people interested in this work. The convention was a very successful one, and I think has resulted in action on the part of some States, of considerable value to the entire country. The Dominion of Canada, especially, in the action of which the State of Michigan is much interested, has taken very active and important steps toward the inspection of immigrants who are likely to bring the disease into this country, and the disinfection of their baggage.

Cholera is a disease which is more likely to be brought into this part of the country by means of baggage of immigrants than in any other manner. If you can be sure that the baggage of all immigrants is thoroughly disinfected before it comes into the State of Michigan, you can be pretty sure that we are not going to have cholera. I remember, when I was a lad, that the cholera prevailed in Ohio, at Sandusky, and that the results were more serious, perhaps there, than in any other community in the United States where the disease has prevailed. Nearly all those who were able, or who did not have the cholera, moved away; the city was almost depopulated, by removals or by death; I don't remember the number of deaths. The cholera was brought into that city at that time by a number of immigrants who came on a steamer. Immediately after they left the steamer, their baggage was taken out of the chests and trunks, on the docks, and washed and hung out to dry. From this baggage the disease spread, and the city of Sandusky was desolated. Other towns in its vicinity suffered more or less from the disease, and as some of the older ones here remember, its ravages were felt through a large part of the United States. I simply speak of this as an example of how cholera is usually brought into a community.

It has been the aim of the Michigan State Board to see that no immigrant comes into the State of Michigan whose baggage has not been thoroughly disinfected.

In September of last year, the State Board passed its quarantine resolutions. These resolutions followed the proclamation issued by President Harrison, providing for a quarantine of twenty days at the Atlantic ports of the United States. The same steps were taken by the Michigan State Board of Health, for the reason that the quarantine of the President could only affect immigrants who come by the Atlantic ports in the United States, and did not affect those who come by Canadian ports, while very much of the immigration into and through Michigan is by Canadian-Atlantic ports.

The quarantine resolutions of the Michigan State Board of Health were soon after modified so as to authorize the inspectors of this State to permit immigrants who were healthy to come into and to pass through Michigan without delay, provided their baggage had been thoroughly disinfected; and up to the present time these resolutions as so modified by the Michigan Board of Health have been substantially carried out. Though we are having a little trouble in some portions of the State, especially with the railroads at Sault Ste. Marie, in regard to the carrying out of these resolutions and of the rules and regulations based upon the quarantine law of the last Legislature, we believe this will soon be settled.

So far as the United States is concerned, I am sorry that I cannot speak encouragingly of its efforts, thus far, to prevent the introduction of cholera into this country. You all, perhaps, understand that the United States does not quarantine; quarantine is done by the States. In the city of New York, where possibly two-thirds of the immigrants who come into this country pass, the quarantine is under the control of the State of New York. The immigrant ships are boarded at the quarantine station by the state officials; if the immigrants are healthy, they are permitted to pass without detention, and are immediately conveyed with their baggage by boat to Ellis Island, the United States immigrant station. If cholera or other dangerous contagious disease prevails, healthy passengers are landed at Hoffman's island and the sick are conveyed to the hospital on Swinburne island. The Ellis Island station is a very fine one, recently built by the United States, and takes the place of the old Castle Garden in the city of New York, where for a great many years immigrants used to be landed. It is a large building, and as the immigrants leave the transfer boats, they are taken into a room, and from that room they are made to pass ten feet apart, through a passage into another room, where clerks are stationed, who give them certificates, of their having passed the state quarantine. As they pass through this passage, the United States inspectors examine them closely, three men and one woman inspector. If there are any indications that an immigrant is not altogether healthy, is a contract laborer, idiotic, likely to become a pauper, or is otherwise legally disqualified, he is passed off into a side room for further examination. The United States Marine Hospital Service Surgeon at Ellis Island issues certificates, which state only that the immigrant possessing them has passed the quarantine inspection (meaning the state inspection by the health officers of the port of New York), and these certificates which mean that the holders are not actually sick, the railroads consider gives them authority, to take immigrants who hold them wherever they choose to go. This is all there is of quarantine protection, unless cholera or small-pox is actually present, in the great port of New York.

Under the law which was passed at the last session of congress, provision was made whereby immigrants should be collected at points in the old

country for inspection, with, if necessary, disinfection of their baggage and clothes. It is known as the barracks system. Immigrants are congregated in buildings erected by the transportation companies, and there kept five days, subject to inspection. If at the end of the five days they are found to be healthy, they are permitted to proceed on their voyage across the Atlantic. A theory of Marine Hospital Surgeon General Wyman is carried out, I presume, in this law; at all events, he seems to place a great deal of confidence in this method, and has recently sent over Surgeon Wheeler to see how well the plan worked. The letters of Dr. Wheeler are not encouraging, and I think, gentlemen and ladies, when you consider the methods, you will decide that it is not the best, because if you take a lot of immigrants, and herd them together in barracks, and one of them is afflicted with any communicable disease, he is very likely to communicate it to the rest. Now, it seems to me that a better plan would be to separate them just as much as possible, and I am confident from letters published from Surgeon Wheeler, that he has the same opinion. The baggage is disinfected, provided the immigrants come from places known to be infected; otherwise it is not disinfected.

Hence, notwithstanding dangerous communicable diseases exist in every Europern port, immigrants reach New York and finally the Michigan border without disinfection of baggage and without detention.

The plant on Hoffman's Island belonging to the State of New York, for the purpose of the disinfection of baggage of immigrants, is ridiculously and absurdly inadequate. By means of it you could not disinfect one-tenth of the baggage of immigrants who come to this country through the port of New York. It is not only ridiculously and absurdly inadequate, but it is not used. No baggage of immigrants coming into this country by that port is disinfected, unless there is some disease like small-pox, or diphtheria on the ship, in which event they pretend to disinfect the baggage on the boat in the apartment occupied by the diseased persons. The plant for disinfecting baggage is not only inadequate, but it is impossible for the large immigrant ships to reach Hoffman's Island, in order to have baggage disinfected. The water is too shallow, and none of the large steamers can reach the island. For baggage to be disinfected, therefore, it would be necessary to carry it by "lighters" to Hoffman's Island, and then carry it back again, and that could not well be done.

Hence, today, the only barrier against cholera coming into this country while there is an epidemic of it in Europe, is such action as the interior states may take. Dr. Jenkins informed us that he had succeeded in securing a large appropriation which he thought would be ample, for the purpose of enlarging their plant, for deepening the water so that ships could reach Hoffman's island, and for making all the provisions necessary for disinfection of baggage. It has not yet been done.

Immediately after the meeting that I speak of in New York of the State Boards of Health, the Dominion of Canada took an admirable step, and baggage of all immigrants coming to this country by means of Atlantic-Canadian ports is, we think, pretty thoroughly disinfected by steam,—the only proper way. Containers of baggage, however, some of which would be ruined by the action of steam, are not subjected to its action. The State Board of Health of Michigan has provided, in its rules and regulations, that the baggage shall be disinfected by steam, while the containers are disinfected by the fumes of burning sulphur. The Dominion disinfects the contents of trunks properly, we think, but its rules provide that

the trunks or other containers shall be disinfected by causing them to be wetted by means of a brush with a solution of bi-chloride of mercury, which will do the work well, provided that every portion of the container is touched, or if there is no grease or any other substance on the container by which this solution is prevented from coming into contact with the surface of the trunk, chest, or whatever the baggage is contained in. The difference between the methods of the Dominion and those of the State Board of Health of Michigan, is simply in this one thing; the State Board of Health of Michigan insisting that no immigrant shall come into the State without not only his baggage being disinfected by steam, but that the containers of such baggage shall be disinfected by the fumes of burning sulphur.

There are two railroads which bring immigrants into this State through Canada, the Grand Trunk and the Canadian Pacific. The Grand Trunk railroad realizing that if baggage had been actually disinfected at Dominion ports it was useless to again disinfect it, asked the State Board if by some means they could not obviate the detention at the Michigan border, and stated that they were willing to do anything that the State Board might suggest. Very soon after that, an arrangement was made by which an agent was sent to Point Levis in Canada, where the disinfection of baggage and containers according to Michigan requirements is carried on, at the expense of the Grand Trunk railroad, in a plant which it has erected there for that purpose, so that the baggage coming into this State by that route being properly inspected and disinfected there, is admitted without any further disinfection at the Michigan border. The Canadian Pacific railroad have not seen fit to adopt our suggestion that they also employ an agent for that purpose, and we are having some trouble with the officials of that road at the Soo; but we think they will by and by see the importance of complying with the rules of the Michigan State Board of Health.

I believe, Mr. Chairman, that I have explained to you the action of the State Board of Health of Michigan relative to what we think best to do in regard to cholera. I wish to impress upon the minds of the ladies and gentlemen here, the statement I have made before, that if cholera is kept out of Michigan, it will probably be due to the action of this Board rather than to any action of the United States. The rules of the State Board of Health of Michigan say that the baggage of all immigrants who are to settle in Michigan must be disinfected. I believe this policy should be general, and that, if the "pauper labor of Europe" must continue to swarm into this country, we insist that it shall at least, come to us free from filth and from disease.

SECOND SESSION, THURSDAY, JULY 6, AT 8:00 P. M.

After a piano solo by Mrs. C. S. Walcott, the following papers were presented:

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF A LAWYER.

BY W. H. FRANKHAUSER, HILLSDALE.

When we look around us at our disease-scourged race, and see men and women stricken down by dangerous, incurable maladies, even before their

sun of life shines at its meridian; when we see innocent childhood carrying upon it the horrible marks of hereditary disease; and still further, when we see like a whirlwind of fire, some awful scourge sweep through entire communities, visiting every household, snatching from the loved embrace of each family the one most beloved, we are much inclined to murmer against Providence, and mentally if not orally declare that it all presents a spectacle of cruel injustice, and the God who gave us our being no longer cares for us, when he thus permits such inexplicable visitations. We wonder, when we look around us, and see pale consumption and innumerable other ills carrying from us those we most need; when we see helpless childhood introduced into the world, blind, deaf, or worse than all, idiotic; whether God ever said of such a race, "Let us make man in our own image."

To answer this question in the affirmative would be to say that when God spoke the miraculous word which made clay, man, he in the same instant and in the same word created this horrible category of diseases, which puzzle our physicians, and which, without regard for race, color or age, sweep from earthly existence whoever chance in their path.

But we would show an absolute want of reverence, and a total disregard of the divine attributes of Him from whose hand we sprung should we thus conclude; and moreover we are expressly informed otherwise. Man was created perfect, we are taught, and if we will examine the book of Genesis, which faithfully portrays about 2,500 years of human history following the creation of man, which gives in the minutest detail what people enjoyed and suffered during that long expanse of time, we will not find one instance of disease; people all died of old age; the simple record is "and he died" or "being full of years, he died at a good old age." Not one instance is given of a child born deformed, either mentally or physically. A son never died before his father, and unless it is in the isolated case of Jacob, no sickness whatever is chronicled.

But about this time polygamy began, and excesses of the most revolting kind were indulged in, the blood of the pristine race was polluted so that its vigor was gradually worn away; then diseases first made their appearance, leprosy and kindred ills fastened themselves upon the human family, until it could be truly said that disease became the rule, and good health and pure blood, notable exceptions.

Thus we see, by this brief hurried resume, that ill health, diseases came among men from natural causes—they were results, effects, of certain conditions—excesses, disregard of the laws and conditions of their being, and not because of special or local visitations of Providence; nor as specific punishment for sins; but for the simple and sole reason that man disregarded and held in contempt the rules laid down by his Creator, the observance of which was as certain to give health and growth as the disregard was sure to bring disease and decay.

The indispensibility of good health, and the vigor which comes from pure blood, to nations as well as individuals, has been in modern times recognized in proportion as people are becoming truly civilized and christianized. Individuals never attain the height to which they aspire—never reach the round in the ladder to which they aim, without the physical strength to carry into execution their lofty and worthy ambitions. How often we see the hand of a brave, determined and ambitious man fall by his side, for want of physical force to perform the work which has been

planned. All along the path of our daily life, we see spots where perished a noble endeavor for lack of physical force to carry it forward.

So collectively as nations, our longevity depends upon the physical vigor of our citizens. How long would a nation of invalids keep its flag waving in the sky? While we are wont to indulge in the pleasing dream of the pen and not the sword, doing the ruling in this country, I believe our flag remains undisturbed for one reason alone, and that is — that if occasion offers, we have strong, vigorous millions who are ready to form themselves into an unconquerable army, who are capable of reaping a harvest of death from the fields of war. In other words I think the physical strength and valor of our people would be the principal thing relied upon by our rulers should a defense of our flag be called for. So completely have these facts been realized, that this question of prevention of disease has secured the attention of the State. Laws have been, and are being, made, with penalties attached, calling upon the people to do or not to do particular things the observance of which laws is expected to be conducive to the securing of such conditions as will prevent disease and restore health.

In England at quite an early period, the necessity of laws for the preservation of the public health, was recognized; and we find vigorous statutes with severe penalties passed from time to time, some of them going so far as to make it a felony, for any one who had the misfortune to be suffering from a communicable disease to disregard them.

The idea of isolation or quarantine was adopted and applied with great strictness. England being a country from which our system of jurisprudence is taken, thus early set the example, which has been largely followed in the several states of our union.

The question is, how far ought the State to interfere in the passage and enforcing the laws, for the prevention and spread of dangerous communicable diseases? The State goes to great lengths in the protection of the citizen in the enjoyment of his civil and political rights, and the right of the State to thus protect by legislation, in view of what is known as its police powers, is unquestioned, and I do not think that the limit of its jurisdiction has been by any means reached as yet. But in this case as in a multitude of others, the difficulty is not in securing the passage of proper laws, but in the strict and conscientious enforcement of the laws which are given us.

Laws have been enacted in our State creating local boards of health, and a State Board of Health, representatives of which are with us at this meeting; this State Board of Health each year has increased powers given them by our legislature; even at this last session of '93, have these powers been greatly increased, especially with reference to the question of communicable diseases. This Board has absolute power to establish a system of quarantine for people who come from places infected with such diseases. It has a right to stop people in their travels, disinfect their baggage, hold them until such time as in its sound discretion it chooses to let them depart. It has the right to demand the coöperation of local boards of health to accomplish any of the purposes of its organization. Besides a State Board of Health, we have in each municipality — each city, village and township — a legal body clothed with legal powers, known as local boards of health, whose duties are manifold, and whose worth and benefit to the community are being well appreciated and recognized. They are

the sentinels on the watch tower; to them the community have a right to look for warning on the approach of danger.

Added to this we have penal statutes, making it the duty of any citizen to report to the board of health such facts as he may have in his possession touching the existence of any such communicable disease.

And without further entering into detail of the discussion of their duties, I will be permitted to say, without having the least desire to censure any one, that the problem to me most important, is how shall we get a complete and proper enforcement of these laws, which relate to the sanitary conditions of the community.

What can we say or do at this meeting which will impress upon these men, these officers of the law—these guardians of the public weal, the high moral, social, and civil obligation to which they are under to the community. Closely allied to the boards of health naturally, are the physicians, and the importance of the most amicable relations between these co-workers in this common cause, cannot be over-emphasized.

They all have the most solemn and most sacred duties to perform. I have always said and I believe that the most sacred of Professions is that of a physician—his profession calls for the exercise of integrity and the practice of personal virtue more than any other profession.

But how often do we see, and I regret to state it, petty jealousies among our doctors which originate on account of different schools of medicine or for some other insufficient reason, but which result in their failure to join hands in the accomplishment of the loftiest of objects, viz., the preservation in the community of that greatest and perhaps rarest of blessings, good health.

The physicians ought to realize that upon them rests the responsibilities of the community in this regard—they are the logical educators of the right kind of sentiment among our families. They are in such a situation in the course of their practice as to be able to see better than any one else the short comings of the people; the mistakes they make; the causes of disease, the unsanitary practices indulged in, in families where they have patients, and a thousand other things, the correction of which would forestall many sad and unhappy experiences.

While laws on these subjects may be of some avail, as indeed they are, yet the most effectual way, as everybody will concede, to prevent the spread of dangerous communicable diseases is to instill into the families of the community the necessity of personal cleanliness, and the physician is the one of all others to impress that lesson upon the people wherever he goes.

RESTRICTION AND PREVENTION OF DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE HEALTH OFFICER AND PHYSICIAN.

FRANK M. GIER, M. D., HEALTH OFFICER, HILLSDALE.

It is no longer a theory, but is now a settled scientific fact, that each communicable infectious or contagious disease is dependent upon and is the legitimate result of the ravages of a specific germ always characteristic of the disease. The disease is a direct result of the invasion of the germ,

or of a series of poisons, generated by the germ in its destruction of tissue.

In presenting this paper at a public sanitary convention, to wh invited ladies and gentlemen from all walks in life, I have thought to dispense with scientific terms and expressions, as far as possib describe to you as best I can, with the aid of illustrations, the caus a few of the most common communicable diseases, giving a descript the germ, its mode of invasion, a short account of its destructive and the methods now in use for the restriction and prevention disease. It cannot be without interest to know that the germs such diseases as consumption, small-pox, cholera, typhoid fever, diph measles, scarlet fever, and others of our contagious diseases, have be covered, named, classified, and carefully studied, within the last years. So rapid has been scientific progress in these lines, and has been discovered by the aid of the microscope, in disease and in media, that the relations between the pathogenic germs and patho conditions in most contagious diseases are settled facts.

To accomplish what is embodied in the title of this paper, in other to restrict or limit the ravages of contagious disease, or, better, to pr their outbreak, necessarily demands a thorough knowledge of their c tion, and, as it has been proved beyond any doubt, that each di depends upon its specific pathogenic germ, we naturally inquire: Wh a disease germ, and how can we destroy it?

Formerly these germs were supposed to be animal life; but most of disease-producing germs are now recognized as vegetable micro-organi I do not mean, of course, that there is no microscopic animal life, for universe teems with these infinitely small creatures, greater in number variety than their visible relatives; but the germs that cause or enter i the cause of most of our communicable diseases, are vegetable. So clo are they allied, however, and so nearly alike are their characteristics, t it is well-nigh impossible to differentiate them, the principal method which is to distinguish the manner in which they take their food.

To give you some idea of the appearance of a few of these germs, I hav tried, in these illustrations,* to make a copy from the small plates in o works on bacteriology. You will readily notice the difference in size, shape, and general appearance. Some are rod shaped, some dot shaped, some the shape of a comma, some are crescent-shaped, and others are spiral shaped. In size, they vary in proportion to the varying sizes of visible animal life. The standard of measurement used by bacteriologists is the micro-millimetre, which is equal to about one twenty-five-thousandth of an English inch. Some of these germs have been found that were one-three-hundredth of an inch long. Think of it! 300 of them in line to cover one inch, and these are the mastodons, the giants of the germ kingdom. Others are so small that it takes 25,000 of them, placed end to end, to cover the space of one inch; and it is estimated that it would take hundreds of thousands of these live, active, organized, disease-producing germs, to displace a single drop of water. Their movements are interesting, and seem almost to be directed by consciousness. In a drop of liquid under the microscope, they may be seen moving singly or in pairs, then again in a row, chain-like, or in masses. They may be seen shooting across the field of vision like a flash, then backward as fast, remaining motionless a

* The "Illustrations" to which Dr. Gier refers, were not supplied by him for reproduction, therefore they are not printed in this pamphlet.

moment, then spinning with wonderful velocity, and again dashing back and forth as long as watched.

Sternberg says of these bacteria that they are uni-cellular; that is, one single cell, which consists of a cell membrane, enclosing transparent, and apparently structureless protoplasm. The varied biological characteristics which distinguish different species make it evident, however, that there are essential differences in the living cell contents, although these differences are not revealed by our present optical applicances. And among the bacteria, as in the cells of higher plants and animals, the peculiar biological characters of a species are transmitted to the progeny of each individual cell. These characters are, however, subject to various modifications, as a result of different conditions of environment, as is the case with plants and animals higher in the scale of existence, and in this way more or less permanent varieties are produced. It is probable that among these lower plants species are evolved more quickly as a result of the laws of natural selection, in the struggle for existence, than among those of more complex organization.

They multiply very rapidly, and in most cases reproduce by binary division. By this is meant that the cell enlarges, then elongates, and divides into two by constriction through the center of the cell. The constriction soon divides the original cell, leaving two new, active cells, which in turn soon divide, and, though they are so very small, and singly unimportant, yet it is estimated that if nature had not provided a means for their destruction, in a very few days there could be evolved from one single cell bacteria enough to fill the ocean.

In their development, and in their destruction of animal tissue, there is produced a poison which soon destroys the germs that come in contact with it; but this same poison there produced, and always characteristic of the species of germ invading the system, causes the characteristic constitutional symptoms of such diseases as cholera, typhoid fever and diphtheria.

What is the origin of the germs of consumption, cholera, scarlet fever, diphtheria and typhoid fever? I cannot tell you. I do not know the origin of the horse, the sheep, or the dog. But this is true; there is not a single case of cholera until the patient has been infested by the comma bacillus; there has never been a case of typhoid fever without the presence of the typhoid bacillus; no child ever suffered the furies of diphtheria, unless the membranes of its throat were first covered with the *Bacillus diphtheriæ*.

Where these pathogenic germs are unknown, infectious diseases are unknown. Put out of existence these disease-producing germs, and we shall bury no more of our dear ones, destroyed by consumption, typhoid fever, or diphtheria. And in this lies our duty, to destroy as many of these pests as possible, and then keep at a safe distance from the balance of them.

Nature kindly comes to the assistance of mankind, and protects many of us by destroying these germs even after they have invaded the system. There is inherent in all animals, and manifest to a greater or less extent, a physiological resistance to the infectious diseases. There is no doubt but that every adult in this audience has at some time unawares entertained the germs of the contagious diseases of Michigan. We have at some time come in contact with them, dancing in the air, have breathed them into our lungs, we have taken them into our drinking-water, have swallowed them with our uncooked food, have carried them in our clothing

and in our hair, have handled them clinging to some old book or paper, and have brought them from some hiding-place where they have lain for years. But bacteria alone, even though of the most virulent type, are not capable of causing disease, unless the conditions are favorable. If this were not true, the world would long since have been depopulated. Associated with the pathogenic germ must be a condition of susceptibility on the part of the patient. This may be an impoverished condition of the blood and secretions, abnormal excretions, enervation, and a generally lowered vitality of the system. What is there that will produce such conditions as will unhealthy surroundings, poor ventilation, and unsanitary environments?

Cholera and typhoid fever abhor cleanliness; they avoid the clean streets and sanitary homes of our cities, but swoop down with fiendish vengence into the hovels and huts and alleys where swarm the human wharf rats. It is nature's rebuke against filthiness, and exhorts us that cleanliness is surely next to godliness. And, beside furnishing breeding-places and the best possible conditions for the development and continued existence for some kinds of germs, these very unsanitary surroundings impair the health and vigor of the inhabitant, and make him the fit subject susceptible to germ invasion and the development of disease.

One phase of this subject is of such importance, so little is thoroughly understood, and so much can be accomplished by a thorough knowledge of it, not only in restricting but absolutely preventing outbreaks of communicable diseases, that I feel it a duty to repeat the sentiments I have tried to express: The most putrid and offensive and unsightly cesspools, rubbish heap, or closet vault, cannot and will not alone give you cholera, typhoid fever or diphtheria. Such conditions may enfeeble you by impairing general health and vitality, and thus make you ready subjects for the diseases, but without the presence of the pathogenic germ, they are harmless compared to their condition when infected with the disease germ. Drop a single germ of cholera or typhoid fever into such a cesspool, vault, or garbage pile, and immediately the whole will become a living mass of death-dealing forces. Such spots are the most fertile fields for a few kinds of germ development, and from a single one of these hundreds may be infected, as is the case now up at Ironwood, where they are fighting an outbreak of typhoid fever. It is a remarkable fact that since I have acted as health officer in this city of 5,000 souls, over three years in time, there has not been reported a single case of typhoid fever. Why? Simply because we are not pumping any typhoid fever germs from old Baw Beese lake.

The channels of infection are mainly through the mucous membrane of the bowels and stomach, and through the mucous membrane of the organs of respiration. We take the germs of typhoid and cholera in our food and drink, and if they are not destroyed by the digestive ferments, and by-products of digestion, they immediately begin development and their work of destruction. We breathe the germs of consumption into our lungs, and if they are not destroyed by the action of the secretions and blood, they immediately there set up inflammation and destructive changes.

Consumption, the plague of mankind, the disease that destroys at least one-eighth of the human race, is a communicable disease, the germs entering the system in most cases through the mucus membrane of the lungs. It has been proved beyond doubt that we do not inherit con-

sumption; we inherit a susceptibility, a condition favorable for the lodgment and development of the tubercle bacilli.

I have tried, in my humble way, to describe to you the causation of the dangerous communicable diseases, giving a short general description of the germs, how they develop, how they enter the system, and what their effects. It remains now to recite the latest method for disinfection and destruction of these germ pests.

I find that many, or most people, do not understand the meaning of the word disinfection. To them, anything that will destroy offensive odors is a disinfectant. But this is far from true, and one of the most fatal mistakes ever made. To the masses, the purpose of disinfection is to destroy the offensive odors in a sick-room, a closet vault, or a decomposimg mass. The true object of disinfection is to prevent the extension of infectious diseases, by destroying the specific infectious material which gives rise to them. The injurious consequences which are likely to result from such misapprehensions and misuse of the word disinfectant will be appreciated when it is known that recent researches have demonstrated that many of the agents which have been found useful as deodorizers, or as antiseptics, are entirely without value for the destruction of disease germs.

The American Public Health Association had a special committee on disinfectants, and the following are briefly its recommendations:

The three methods of disinfection are, first by fire, destruction by burning; second, subjecting anything to be disinfected to superheated steam, or dry heat; and third, by the use of the chemical germicidal poisons.

For disinfection of clothing, bedding, and rags:

I. If of little value, complete destruction by burning.

II. Boiling for at least one half-hour.

III. Exposure to superheated steam, temperature 221° F. for 10 to 20 minutes.

IV. Exposure to a dry heat for two hours at a temperature of 230° F.

Furniture and articles of wood, leather, and porcelain:

Washing several times with a 2 per cent solution of carbolic acid.

For the person:

The hands and general surface of the body of attendants of the sick, and of convalescents, should be washed with:

1. Solution of chlorinated soda, 1 part to 10 of water.
2. Carbolic acid, 2 per cent solution.
3. Mercuric chloride, 1 part to 1,000 of water.

For the dead:

Envelop the body in a sheet thoroughly saturated with:

1. Chloride of lime solution 4 per cent.
2. Mercuric chloride, 1 part to 500 of water.
3. Carbolic acid, 5 per cent solution.

For disinfection of sick-rooms:

1. First rub the surface of the walls and ceiling with a piece of new bread, if the walls are painted or covered with paper. This is the best method to detach any germs.

2. Fumigate with sulphur dioxide or fumes of burning sulphur for 12 hours, using at least three pounds of sulphur for every 1,000 cubic feet of air space in the room.

3. Then wash the walls with:

(*a*) Mercuric chloride solution 1 to 1,000.
(*b*) Carbolic acid, 2 per cent solution.

For excreta. In sick-room:

1. Chloride of lime, 4 per cent solution.
2. Carbolic acid, 5 per cent solution.
3. Sulphate of copper, 5 per cent solution.

For closet vaults:

1. Mercuric chloride, 1 part to 500 of water.
2. Carbolic acid, 5 per cent solution.

The infectious character of the dejections of patients suffering from cholera and from typhoid fever is well established. They are as dangerous in mild cases as in severe or fatal ones. It is probable that epidemic dysentery, tuberculosis, and perhaps diphtheria, yellow fever, scarlet fever, and typhus fever, may also be transmitted by means of the alvine discharges of the sick. It is therefore very important that these should be thoroughly disinfected.

In cholera, diphtheria, yellow fever, and scarlet fever, all vomited material should be looked upon as infectious. And in tuberculosis, diphtheria, scarlet fever, and infectious pneumonia, the sputa of the sick should be destroyed by fire, or thoroughly disinfected.

Statistics from the State Board of Health show that hundreds of lives are saved in Michigan every year by attention to these methods. If citizens would unite with health boards in a complete observance of methods now observed by sanitarians, we could not only restrict, but absolutely prevent, such diseases as typhoid fever, cholera, diphtheria, scarlet fever, small-pox and consumption.

Prevent these diseases, and death will come, not, as the poet said, "like some untimely frost upon the sweetest flower in all the field," but in the autumn of life, and with the gathered grain, and when the fruit has fallen from the trees.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF A MINISTER.

REV. RANSOM DUNN, D. D., HILLSDALE COLLEGE.

LADIES AND GENTLEMEN: At first thought it seems to me that I am out of my place. From early boyhood I have been accustomed to deal with mind and conscience, with the spiritual portion of our natures. I am asked this evening to talk a little about the physical—this old body—lump of clay—materiality; and, after all, with due deference to those that have spoken before and will speak afterward, I have to confess that this old body has considerable to do with human happiness, after all. Happiness itself is purely mental, spiritual, feeling, susceptibility; but the body has something to do with it; and so we are in favor of good health. And that is not all; it becomes a matter, really, of moral obligation. The particular point before my mind in my talk, if I talk at all, is the mind in relation to the health and bodily powers. It is my opinion that that feature is hardly sufficiently considered, and if we take it up, we see how much depends on the state of the mind.

First of all, that mother, holding her little infant in her arms, holds in her fingers, or, rather, in her mental powers, that which is the well-being of that infant, and long years afterward it may suffer disease from the treatment given it by that mother. A little too much indulgence with reference to appetites, a little carelessness in exposure, in a thousand ways those fingers may press the fibres of that little body so that by and by it will come out a diseased body.

And the teacher—nothing to do with the body, but there to educate the mind, that highest of all callings—and yet a little carelessness on the part of that teacher about ventilation, a little carelessness about excessive study, beyond what the body can bear, a little carelessness about exercise, may turn that child into a diseased and early death. Teachers don't always consider how much in their mind, their own education, they hold the destiny of their students and pupils. And even those occupying the sacred desk don't realize in how many ways they can give advice here and there in such a way that they kill a man to save his life. They have it in their hand to do it, very readily.

A minister might go into a room where there is somebody a little sick, and he not know but what he is very sick, and with his long face, and long breath, and breathing, carrying the impression that there is death right there, and he may visit that sick-room and death will come in less than thirty days. A good many ministers are unconsciously murderers, after all. It isn't exactly murder, but taking human life; they can kill a good many. Then they may go clear to the other extreme, and say, "There is nothing the matter with you," and just lie to that patient, to give him better courage. That wouldn't cure him, nevertheless. When the doctor comes up, he will say, "I know better; he is lying to me." He may get a patient mad, and get him well that way, perhaps; otherwise, it won't do him good. There are extremes in all things. The point is just here; that we are so related to each other that in our warmest friendships there are forces that may produce disease and death, in our relations in life everywhere. Why, I have even heard of lawyers having power enough over their clients, sometimes, to encourage them in litigation when they ought not to be encouraged, and get them to spend all their property, and then kill themselves to get out of the way of the lawyers, and costs.

There are various ways that we can kill men. But, Mr. President, ladies and gentlemen, I particularly think that the thought I have tonight is the power within us, of ourselves, to stand up with firmness that shall resist disease, that shall make death itself stand back, to a certain extent. There is that power in the mind that will do that thing. It seems to me but few are conscious of that mighty mental force that can hold the body in its place amidst excitements that will drive out the madness, so to speak, can hold men firm in their course of life, and not allow them to give up—the power of the mind over the body. It is this power which was sometimes developed in witchcraft in former days, and something like witchcraft in modern times, by the manifestations of the mesmeric and hypnotic force. The same power is seen too, very often, in what they call Christian science. Yes, and that mighty force, the prayer of faith, shows the power of mind over the body. I have no doubt that a great many men and women have really supposed they were cured by prayer. Well, they were. They were in reality enabled to feel the power of mind; they thought they could do it, and they did it; that is all. I am not going to discuss this in detail. But there are all these different forces, all of them

showing to me that, the mighty force of mind over matter, and of the mind over the body. But, let me remark for a moment, for all will consent to what I say, to a certain extent, and I know these doctors will agree that they haven't much faith in medicine unless a man has his mind somewhat ready, at least. They understand now that there is a great deal depending upon the state of the mind, whether that medicine accomplishes the purpose or not. And what is that state of mind? One will say? "Well, you just resolve you won't be sick, just resolve you won't die, and you won't." Its a piece of consummate foolishness. Lots of us think we won't die, if we can help it. Of course we do; but it don't make us live. Will power won't quite do it. Simple will will not make you well; there must be something back of resolution. When I hear a man say, "I am not going to be a coward; I am going to fight," that is the first one that runs. The more one resolves against weakness, the more it shows his own weakness. There must be a courageous soul. I knew a doctor once, a pretty smart man he was, too. He wasn't weak-minded. When he got older, he got a little cranky, as we term it nowadays, and a man wasn't going to die if he said he wouldn't, and he got it into his head that if he made up his mind to live he would live. He would open his windows and sit in the draft, and all such things. He thought he would live anyway. Well, it ran along that kind of way until he got crazy; and he died, after all. His will didn't do it. I have visited so many that said they had resolve and faith that they were going to live. That wouldn't do it. Others live because they are full of vitality, full of hope. Some doctors are led to give them up; sometimes they get well when they can prove why. I well remember a time when two physicians visited my family day after day; they loved a friend there; and one came in with his cheerful look: "Oh, you will soon be over it; it is nothing but a cold." He talked too much that way. It wouldn't do. The other came in, calm and deliberate, without any excitement or fear. I remember well his look—a large, portly man, rather solid—substantial—he gave no false views; no false opinions, no fears; he left an impression of courage and force. It isn't exactly, then, the cheerfulness. The fear will sometimes kill a man. Will will sometimes save him; but the statement that I would particularly call your attention under is that power to resist disease, communicable disease, to my mind, embraces this other element. A man wants to know something—something to busy his mind with, besides his disease, besides his circumstances; he wants to know something, and then he wants to have something to do; something to think of; something to occupy his mind, that will serve to brace, so to speak, all the powers of the mind, and develop a kind of natural force, and then with that kind of knowledge, and that kind of force, that rises from the knowledge and the work on hand, there is then an inner courage and force that stands not simply in the hope of the future, not a fear of the consequence, but just simply silence, and, as it is written in the Book, "Having done all, to stand." Live one day at a time. Just be firm in that conviction.

It is fifty years since I began visiting the sick professionally, in my way of doing it. I didn't carry any pills, in those days, but I visited the sick. I early came to the conclusion that my best way was to tell those sick folks, "Just live today. We don't know whether you are going to get well or die. It don't make much odds, if you only live well. Just live good today." Talked in that way, without exciting fear. When I have been asked, many a time, "Think I will get well?" "I don't know." "Did

you tell him you thought he would die?" "No, I wouldn't." That has been my custom, to leave them to feel just that; to leave them in the conviction to live one day at a time; that state of mind, not to fool yourselves into minding nothing about it, and suppose it is all right to live just as you have always done, and eat just as you always have eaten, and eat yourselves to death in three days. It wants some care—it wants some caution. The simple will will not do it; but that eternal calm firmness, as near as I can express it, just about the same state of mind that a general wants in his soldiers, a great deal; not dying of fear, not talking of it, but simply standing firm, to take his stand and say, "Let us take hold and press on to something higher and better." There is a kind of mysterious idea I want to suggest right there, whether I shall be understood or not. Some speakers and lawyers and some in the pulpit know what it is sometimes in getting up before an audience, there is a kind of subjective force, what the old mesmerists used to say, fifty years ago, it was an eternal will to do something. It is the mind power. I will not stop to try to explain it. It is the kind of mental force, strength of mind; a kind of resolution within; a power in one to gain this point, by which this one and that one succeed, simply by that subjective force, that power of resolve. I will give a little item of my experience.

When I was quite a young man, as I stepped up to the pulpit one morning to preach a funeral sermon, a friend came to me with great emotion, and asked me to take a certain text. I had just time enough to think about it and walk the length of the church. An orphan made the request, and so I thought the text was worth more than my sermon; and so I resolved to do it; and there was time enough, and far enough; and I began, and I hadn't spoken more than five minutes before I saw Josh Giddings and Ben Wade sitting right there, side by side. It was within four miles of their home that we then were. Giddings was the Congressman there, and Ben Wade was practicing law; the two most prominent men of that county. Well, I was a young man, pretty young at that time to look at two such men sitting there; for they showed bigger giants than you ever knew of in the old days. I would have given all the old shoes in the world if I could have got them out of the house; but there they sat. Neither of them was strong in sympathy with such work as I was doing, anyhow. I have never known of either one having any great sympathy with that kind of work; but they were there. They had sympathy for the Judge, they had practiced law before him, and they thought they would come out and attend that man's funeral. What do you suppose I did about it? I wasn't going to give it up; but they were tremendous big men, too big for me. I stood back, I remember my fingers twitched a little and my teeth chattered, but "Go on," says I, "I'll do it," and I did it somehow, I don't know how. But there was a certain kind of strength ran through those nerves, a certain power like electricity, and I rushed on, pell mell. I talked to Giddings and Wade just as though they were common men; I didn't care whether they were in sympathy with me or not, I thought I would show them that I didn't care, and I pitched in, wondering all the time if they enjoyed it. I guess they did. That was an illustration of that mental force that I have felt a thousand times. I have walked up to the pulpit when I could hardly stand, and I have seen my wife clench her hands, when she thought I was going to fall. But as I stood up there, that weakness gave way, and that eternal force carried me up. That will resist disease.

Allow me to say one thing more, that this force of mind largely depends in my opinion on the power of conscience. Man has been termed a conscientious animal; an animal with a conscience; he has a conscience. That conviction in his mind that a thing is right, the conviction of right out of the soul, makes the true soldier, and that same conviction of right goes with a man and keeps him in his place.

So I would state as my opinion that the best force in the world for resisting communicable diseases is general intelligence, internal will force, not specific volition, based on conscience, and standing there; it is right. It seems to me, then, that what we have to do in order to resist these diseases, with all the other things that are opposed to us, we have first to act our part as father and mother, and lead others to do so, and restrain the child when necessary, and gratify it when we can. We have to teach and give instruction such as train the minds of individuals; we have to carry the conviction into the mind, as far as possible, and place one firm, and standing thus firm, we can resist disease. I have passed myself through some scenes of that kind, with typhoid fevers, and some with the cholera within a short distance of where I lived, twenty or thirty deaths occurring rapidly; four of those cases on Sunday morning before my appointment, within the limits of my congregation. I have always seen that where people were the most in danger, it was where they were reckless. Where they were calm and firm, attended to the routine of business as it came around, and rested on their convictions of right, they were safest; and I finally have come to the conclusion that God knew about how to make man, and I think I have a right to my own conclusion, and I believe in this matter that God intended that man should live a good deal by stimulants, and that stimulant is in the mind itself.

Where I was preaching a long time ago, I remember an old Englishman came to my house, when I lived east. "Now," he says, "I am an older man than you are. You have got to take some brandy, or you will die." "Well," says I, "I don't want to die." "Well," says he, "you will have to take brandy." "Well," says I, "it may be that I will die, but I guess not." "Well," says he, "you will have to take brandy, or you will die." "Well," says I "I'll try it." That man has been dead twenty-five years, and I'm living yet. I never touched a glass of his brandy in his life. More than thirty years ago, every one supposed a slight shock on the base of the brain was going to throw me out of the way; every one thought I was going to die, and I thought I was myself; made the arrangements accordingly, and my wife for a long time made all her calculations to be a widow; I don't know whether she enjoyed the prospect or not. Well, I didn't know but she would be. I didn't know. I wanted to preach, and I found I was a little trembly about the knees, and there was a brother got up and wanted to make some remarks. He got up and talked a while. He said he expected it was the last time he would ever see me, and he wanted to talk a few minutes, and so he talked, and he talked gloomy enough. I got gloomier and gloomier, but he talked on, and finally he sat down, and then I was to get up. I got up and looked around. "Now," says I, "I don't know whether I shall die tomorrow or live twenty years, and it is none of your business;" and then I preached. "I dont know whether I shall die today or live ten years, and I don't care; it is none of your business." I talked fifteen minutes, in as cheerful a way as I could. Now, I think that is the most cheerful way for a man to talk.

I was down east two or three years ago, and a minister came up and got

my hands in both of his; "God bless you," he says, "we thought we were going to bury you thirty years ago, and here you are. How did you manage to live?" The other ministers all crowded around. I says, "I'll tell you, gentlemen, how it is. I take stimulants." "What did you say?" "I take stimulants." "Why, I supposed you were a prohibitionist." "Well, but I take stimulants, and that is the way I do it." Well, finally one of them broke the silence, "Dr. Dunn, what kind of stimulants do you take? We would like to know. You are living thirty years beyond our expectation." I says, "I live on stimulants." "What do you take?" "Well," says I, "I'll tell you; it is no secret, particularly. I take a little intellectual exercise seasoned with religion, every day. You try it."

After a vocal duet by Miss Snyder and Mr. Thatcher, the following discussion of the question was participated in by Prof. Delos Fall, M. S., Member of State Board of Health, Albion, and Henry B. Baker, M. D., Secretary State Board of Health, Lansing.

DISCUSSION OF THE SUBJECT.

BY PROF. DELOS FALL, MEMBER OF THE STATE BOARD OF HEALTH, ALBION.

MR. CHAIRMAN: It seems to me a little late in the evening to enter upon anything like any extended discussion of this question. However, I am inclined to follow up Dr. Gier's study of germs, to some extent, and to speak of the method of handling them, reasons why we are so confident in the statements we may make concerning them, and to bring you all into a little nearer and closer sympathy with the general discussion of the germ theory of disease. I have found, in private conversation, that a great deal of mystery surrounds this subject, and a great deal of prejudice exists against it; there is a belief that there is a good deal of it that is theory, mere theory, and not the real practical thing, that we do talk about. Now, there are some things that we believe in thoroughly that are wholly theoretical. We talk very learnedly in our recitation rooms about the theory of light, or heat, or sound, and we have to indulge in that which is a mere theory. We duplicate the theory, or compound theories, perhaps, a lawyer would say. We say it is produced by a hypothetical motion of a hypothetical ether. We have never seen the ether, and yet we believe in it, and no one at this time attempts to describe the action of heat, or the production of heat, or light, or sound, without indulging in these theories, and without using the nomenclature of the science that teaches these theories. We judge of these theories by their effects, and certainly we know, from the stand point of effects, a great deal about the diseases that we talk about. We know pretty well what it is to have the dread scourge, diphtheria, come into the home, lay its blighting hand upon the loved one, cover it over with that which is hateful and ugly—finally waste away the system, and they die—it is the very life itself; this is not theory, this is practical; and yet I say, people suppose that it is theory, when we come to examine into the actual cause of this awful visitation.

I want to say, then, that we know germs as we know other things that are capable of experimentation, much better than we know practically by experimentation the real explanation of heat, or light, or sound. We know them in a practical way. We know them, if you please, in the same way that the farmer judges of a new kind of wheat, or a new kind of potatoes. We know them in exactly the same way the farmer understands

that if he plants potatoes in the ground, he will get a crop of potatoes, and he expects that if he plants a potato of a particular kind he will get that particular kind of potato. If he wants to raise a particular kind of corn, he plants the proper seed for it. He is a little particular that he plants this seed in a place where it will be somewhat isolated from influences of other kinds of corn, for he understands that there is an influence that can come over from one field of corn into another, and perhaps change the variety of corn which he has planted there; but he understands this fact, which is recognized by us all, that if we want a particular kind of crop, we must plant a particular kind of seed, and if we will now begin to turn our thought simply to think of these living micro-organisms which Dr. Gier has talked about as seeds, finding a soil in the body, and of the disease as the result of their growth, the crop, if you please, we will come into the proper attitude of mind towards what is causing disease. How do we know what we are talking about? Why, we know it in the same matter of fact way that the farmer is certain that he has the new variety of potatoes that he has planted with seed which has cost him an extra price to put it into the ground knows that it is the same kind that he has dug out of the ground. We plant these seeds, we raise the crop, we examine the products that we have reaped in this way.

Now, to go somewhat into detail as to the manner of handling these germs. I might have brought here test tubes containing the seeds of diphtheria, or consumption, or typhoid fever, or cholera, if you please, held them up here before you, passed them around the audience for you to examine. I could take them into the laboratory, if I wished, and plant them, get a crop, harvest that crop, examine it in the same way that we examined the original seed, and convince ourselves that we have the same seed that we started with. Suppose I had a test tube here, then, that contained the germ of cholera. I could convince myself that it was the germ of cholera by passing this through what is known as Koch's four rules. Dr. Koch is an eminent physician, a German scientist, who a few years ago visited the home of cholera, and made an extensive study, and as a result of his study announced, clearly to his own mind, some doubt in the minds of others, but afterwards clearly demonstrated, that the exact cause of that disease is the *comma bacillus*. Suppose I had those germs here. I begin to make preparations for planting my crop. They are what is known as sapropyhytic organisms; that is to say, they grow by nourishment which they derive from organic matter which is in some process of decomposition or decay; and we find that one very good soil for the growth of these germs of disease is a potato; and so we will take the potato as soil upon which to plant this seed. Now, I want to be sure that our soil is devoid of all other seeds, just as when I sow the seed of the poppy, we will say, I take great pains, I am greatly desirous that the ground shall not contain the seed of the ugly weeds that shall come up before the baby plant of the poppy that is being planted, and destroy my efforts in raising that beautiful flower. So I must be sure that the potato contains no germs of any kind that will interfere with the growth of this germ which I propose to plant in the potato. We therefore put this potato into a steamer, and subject it to the heat of steam say half an hour at a time, take it out and let it stand for a while and put it in again, so as to make sure that we have heated or boiled away from that potato the seeds, if you please, or disease germs, that may have lodged upon the potato. We will now cleanse our hands by plunging them into some disinfectant, or

some germicidal solution, bi-chloride of mercury, if you please, or something that will be sure to kill all the germs that are upon them. We will take a knife and hold it in the flame of a lamp for a few moments, until it gets red hot, until we are quite sure that we have burned all the germs of disease off from it; we will then take this sterilized potato in our sterilized hand, and cut it in two with our sterilized knife, and place it in a moist chamber, in a dish with a cover over it, that has itself been sterilized or disinfected, so that we are quite certain that now we have a soil that is devoid of all other germs except the ones we desire to plant there. Now, we will take our test tube—which, by the way, is carefully corked by a plug of cotton—strange to say, germs cannnot pass through raw cotton, a simple devise, and yet a most remarkable discovery, which has led to the power we have of handling them without any danger from them. We will take this test tube, then, and take out the plug of cotton quickly and introduce into it a platinum wire which has been sterilized by holding it in a flame, take out on that wire a tiny drop of the material which contains the germ, rub it on the surface of this potato, take our sterilized knife again, and rub it well into the surface of the potato. Now, the trouble is just simply that which always happens when we have too many seeds; so that in order to get a bed where the seeds shall not be too thick, I will take another sterilized potato, take off a little bit of the material from this first one I have planted, and transfer that to the second potato, and rub it well. And now, for fear that the seeds are too thick there, I will take off a drop from the second potato, and put it on to a third, and from the third to the fourth, and so on with eight or ten potatoes, we shall find that at the last we shall have it may be a sixth or an eighth of that original drop upon this eighth or tenth potato. Now, we set this away in our sterilized dish for a few hours or for a few days, according to the length of time the growth of the germ we are handling takes; some develop in a few days, some in a few hours. After a time, we shall see on the surface of the potato a growth, large enough to be seen with the naked eye. Heretofore we have been handling them when they were invisible to our eyes. But now here, as the result of the growth of these germs, we have got a colony so numerous as to be visible to the naked eye. Now, that colony has certain distinctive characteristics, certain appearances that are just as characteristic of this particular germ, of the colony of this particular germ, as a field of potatoes or a field of corn. By the appearance, then, of this colony, I may be sure that I have my germ.

Now, to be still more sure that I have the germ, I will take off some of this material from the potato, make a little incision into a living, healthy animal, say a white mouse, or a rabbit, or a guinea pig, or a pigeon, if you please; various animals are used. A *man* would be most sure and most satisfactory; but of course we wouldn't try this sort of thing upon a man, and we therefore take the lower animals, and try it upon them. We inject into the animal in a particular way and into a particular place,—the method varying for different germs, of course,—a little of the germ we have grown in that way. And now we watch the animal with care, making sure that it has been put under proper hygienic conditions, given plenty of good food and pure air, so that it may live for everything else except for the particular cause which we have injected into its system. The disease which is peculiar to this germ will be set up in the system of the animal, and after a few hours, or a few days, very likely, the animal will die. Now, the physician who is acquainted with the symptoms of this

disease notices the corresponding symptoms in the body of the animal, corresponding very closely in this animal to the symptoms and the characteristics of the disease as they are noticed in the human body. After the death of the animal, a dissection is made, a post-mortem examination, and the particular kind of tissue which is most affected taken out, very great care being taken now not to introduce into this any germs which may be floating in the air, and which are all about us, that material quickly placed, or a portion of it, on to the slide of a microscope, stained with some coloring or staining fluid which is known to give color to the germs, lay a clear glass over it, and put it under a powerful lens, and we have now something for examination that we may compare with the examination which we made of the original germ that we started with. If, now, we see that in appearance, in size, in form, in movement, in all their characteristics, these germs that we have recovered from this animal that has been thus subjected to this experiment, are identical with the germs which we first began to examine, we are convinced by this line of testimony that there is a true relationship between the germ which we have planted and the disease which has been caused.

To go once more, then, over these four Koch's rules, they consist:

First, in the careful examination of the given specific germ, by a test which I have not now time to describe, the isolation of that germ, so that we get what we call a pure culture, the growing plant, the one germ and nothing else—that is the first step.

The second step is the introduction into the body of a healthy animal of the germ.

The third step is the noting of the effect of the germ upon that healthy animal, that is, that the symptoms of the disease which is set up are the same as the symptoms of the disease from which this germ was obtained originally.

The fourth step consists in the recovery from the various organs of this animal that has been thus affected, of the germ.

Now, any germ that can be successfully passed through these four tests, brings confidence to the mind of the experimenter that he has at last found the specific cause of the specific disease. Now, instances of this kind might be related, and the description of the handling of the germs might go on by the hour; but I have given you enough to show that the bacteriologist understands that he is handling a tangible, living organism, that is capable of doing a specific work; and as a result of his knowledge, published to the world, we know that if we want to be free from these dread diseases, we must look out for the particular germ, and if we know the successful way of ridding the world, ridding the water, ridding the air, ridding the place where we are, of this germ, we have an effective way of preventing entirely that disease from breaking out.

DISCUSSION, BY DR. HENRY B. BAKER, SECRETARY STATE BOARD OF HEALTH, LANSING:

It seems to me rather too late to speak further on this topic, but there are a few suggestions that I would like to make. First, I would ask your attention to the importance of the subject,—"The restriction and prevention of the dangerous communicable diseases;" and hanging here at my right is a diagram, accurately drawn to a scale, representing eight dangerous communicable diseases of importance to citizens of Michigan. The

first five mentioned there, during the years mentioned, 1876 to 1887, were the five diseases that caused most deaths in this State. They are arranged in the order of their importance. I want to make that one point clear, that those five diseases were the five diseases that during those eleven years caused the most deaths in the State of Michigan. I believe that every one of those diseases is a preventable disease.

My first point is that of the five diseases that caused the most deaths in the State of Michigan during that time, every one of them is a dangerous communicable disease, and therefore a preventable disease. That, it seems to me, ought to show to us the importance of the subject.

The next point is the relative importance of each of the diseases; and this diagram is accurately drawn to scale, showing the actual condition of things in this State during those years. It is not true today, perhaps, in precisely that way, but I believe it was true during those years, and it is comparatively true now. Consumption first of all, "the great white plague," the disease which carries off more people around the world than any other one; theoretically, now, owing to the discoveries mentioned by Prof. Fall, who has just preceded me, the easiest disease to prevent, the main difficulty being in teaching the people how to prevent it. Next comes diphtheria, the next most fatal disease—a disease, as I believe, thoroughly preventable, just as soon as the people will come to believe what the doctors and sanitary scientists believe in thoroughly. Next comes pneumonia; a communicable disease, which enters by way of the air passages. Next, typhoid fever. Typhoid fever, in this State, causes the death of about one thousand people in each year. In this disease there are very many mild cases, many of them are not reported. The death-rate is about one in ten. We have, then, ten thousand cases of sickness from typhoid fever every year, and every one of them ought to be prevented; we know how to prevent it. Next, scarlet fever, a communicable disease and the fifth one in the list. Those five diseases are the diseases which caused the most deaths in this State, and the method of their prevention is well known and understood by the sanitary officials. Then follow those other diseases, and then down at the bottom small-pox. That line at the bottom accurately represents that disease during those eleven years. If the line were to be drawn now, that line at the bottom representing small-pox could hardly be visible; that is, it is practically annihilated. And if cholera were to be put on the diagram, it would be entirely invisible.

I want to emphasize the point of the comparative importance—the relative importance of those diseases; and I stand before you here today to plead for more work with reference to consumption—"the great white plague." Consumption and diphtheria are the two most important things that concern us with reference to sanitary work. Those two diseases attack people in all grades of life, the cleanly, the dirty, the ignorant, the intelligent, and they have no respect for persons. Cleanliness is no protection whatever against them. The same is true of pneumonia. The same is true of scarlet fever. The same is true of small-pox. I agree with the speaker, Dr. Gier, in all he said in regard to filth and its relations to typhoid fever and cholera. But as regards the most of these diseases, they have no relation whatever to filth; that needs to be understood. Of these diseases represented here, this one, typhoid fever has relation to filth. Cholera has relation to filth. The others, outside of those, are not reproduced outside of the body, as a rule. The germs of consumption, diph-

theria, scarlet fever, pneumonia, are reproduced in the body; the danger, then, is from spreading from one case to another.

Now, how are diseases spread? Some diseases are spread in one manner, some in another. Consumption is spread by the sputum of the infected person; and it does not, as a rule, go direct; it finally reaches the air passages of the susceptible person, but it does not go direct; it goes by means of the sputa of persons who have consumption. Now we come to the practical point. How should consumption be restricted? If all sputa were destroyed, consumption would disappear off the face of the earth. That is my belief. The sputa of consumptives must be destroyed. The most practical way is to burn it. Burn it immediately. If it is not destroyed, it gets scattered on the carpet, the housewife sweeps the carpet, the dust carries it up to the ceiling and walls, and from there, as Prof. Fall has described, it is received into the air passages, has a lodgment there, and communicates the disease. If the consumptive person takes care of dairy cows, and spits on the hay, the disease goes to the hay, and about four or five per cent of the animals will be infected with consumption—tuberculosis. That makes another source through which it may be communicated,—through the milk, and it is spread through the milk of the animals that eat that hay. But if all sputa of all consumptive persons were destroyed, consumption would disappear, probably, just as leprosy has disappeared through very much less vigorous measures of restriction.

The germ of diphtheria is not, as a rule, reproduced outside the body; as Prof. Fall has described, it may be produced outside the body, but only in a laboratory, where they can control the conditions. But as a rule it is not thus grown. It does not enter the blood; the micro-organism in the infected person is in the throat; it comes to the throat of the person who contracts the disease, and he in turn spreads it by means of his sputa. In diphtheria if all infected material from the throat, if everything of that sort is destroyed, the disease is not communicated. But the germs of both of these diseases last for months or years, when deposited as dust around rooms, or on boots, shoes, boxes, or goods which are packed away.

Pneumonia; if all sputa of patients sick with pneumonia were destroyed, the disease would probably disappear.

Typhoid fever; this disease is spread in an entirely different way; by a micro-organism which is perhaps not infrequently reproduced outside the body; and the disease affects not the respiratory organs, but the intestines, and is spread from the intestines of the sick individual to the intestines of the person who gets the disease. That gives us a hint how to prevent the spread of that disease, and it is an important one here in Hillsdale; not so important as when the convention was held here before, because now you have a city water-supply; but the disease, as a rule, is spread by means of the water-supply; which will probably be touched on later.

The next disease on the list is scarlet fever, which is spread very much in the same manner as diphtheria is, except that in this instance the micro-organism is spread from the person from the surface of the body; diphtheria only from the infected part, usually the throat.

On the right, I have a diagram illustrating the results of two lines of work. The column this way—the two columns, or double column, shows the number of cases and deaths in the outbreaks in Michigan, where the rules set forth in these pamphlets which I have distributed this evening have been enforced; where as soon as the person was sick, the patient has

been isolated, and where, after the sickness has been recovered from, everything infected has been disinfected. In those outbreaks the disease is restricted by those two measures,—isolation and disinfection. These two columns at the right show the number of cases in outbreaks in this State where that is not done, where the isolation and disinfection has been neglected. This diagram is accurately drawn to scale, and represents the actual experience in Michigan under those two conditions. I can not see, at this distance, how many years that diagram covers, but I will state the general fact. For the several years that we have studied the subject, the general result is this: There are about five times as many cases, and five times as many deaths, where they neglect to isolate and disinfect as where they do not. That is equivalent to saying that in diphtheria four-fifths of the cases and deaths are prevented by isolation and disinfection. By that evidence we are satisfied of the fact that as a rule the disease is spread from person to person. Four-fifths of the deaths and cases which otherwise would occur are prevented by those two measures, isolation and disinfection, which would not be the case if the specific cause were reproduced outside of the body. Practically the same things are true with reference to scarlet fever; and I have had distributed in the audience this evening diagrams which illustrate this subject; the one diagram gives the facts with reference to scarlet fever, and the diagram on the back of the one with reference to scarlet fever gives the facts with reference to diphtheria. These diagrams are for a single year, and I think show the results very strongly. But, as I have stated, it is the general fact, proved by the statistics for several years, that four-fifths of the cases and of the deaths from either one of these diseases are prevented by these measures which the State Board of Health has been insisting upon during the past few years. I fear I have taken up more time than I ought to at this time in the evening; I will stop now.

THIRD SESSION, FRIDAY, JULY 7, AT 10 A. M.

After a vocal solo by Miss Mae Sheldon, the following papers were read:

VENTILATION.

BY HENRY B. BAKER, M. D., SECRETARY OF STATE BOARD OF HEALTH, LANSING.

Mr. President, Ladies and Gentlemen: In the time alloted to me, I propose to suggest some of the general facts and principles which need to be understood by all who have to do with the subject of ventilation.

These general facts and principles may be profitably studied in groups, as follows:

1. Facts relating to the constant needs of the living body for unbreathed air.

2. Facts relating to air and its movements with reference to the particles which constitute the specific causes of diseases.

3. Facts relating to the causes of movements, and the rates of movement of air.

Quantity of air needed for respiration.

1. In the first-mentioned group is the well-known fact that unless fresh air is supplied to the human body, life is not sustained. Fresh air is needed to supply the body with oxygen which is consumed in the vital processes which yield the forces and motions which constitute the phenomena of life. Fresh air is needed also to displace, drive away, and remove products of vital action, which, if allowed to remain in the body, poison it and lead toward death.

How much fresh air is needed? Those who have studied this subject have generally agreed that about 2,000 cubic feet of fresh air per hour is a fair allowance for each person; and as the vital processes of children are more rapid than those of adults, I believe that school children should have as much as adults.

There is a common fallacy that in a large room a less quantity of air per hour is sufficient. That is true only for the very short time until the air of the room has been once used. However, the room should be large enough to allow at least twenty-five square feet of floor space to each pupil or person; and high enough to allow at least six hundred cubic feet of air space to each pupil or person. One reason for this is that in a less space per person the requisite quantity of air cannot be moved through the space without causing drafts which are dangerous to health. Just how drafts cause sickness may not be fully dealt with here and now; but that drafts do cause sickness has been abundantly proved. In order to prevent drafts the space allowed for each occupant of a room must not be less than as just stated.

Proper Location of foul-air outlets.

2. Recent progress in sanitary science has demonstrated the fact that many diseases, now known as "specific," are caused by living organisms, microscopic in size, but particulate, having weight, being capable of settling as dust upon floors and articles in inhabited rooms. In the human body, there seem to be many natural protections against the inhaling of such dangerous particles. In the first place the normal nose is so formed as greatly to avoid catching dust particles which being heavier than air have a downward motion—the normal nostrils do not open upward, they open downward. In the next place, the opening of such nostril is generally protected by fine hairs, which, being moistened by the air exhaled, tend to catch and prevent the entrance of dust. Thirdly, normal secretions of the membranes of the nose and throat tend to stop the further entrance of particles; and the nasal mucus has power to destroy at least some of the germs of disease. Notwithstanding these protections, disease germs do gain entrance into the body under favoring conditions.

A proper system of ventilation must take account of this group of facts, and must ensure that the general movement of the air of every inhabited room shall be downward. This makes it essential that the foul-air outlet of every room should be at the floor level. And it is best that the fresh-air inlet shall not be in the floor. It is not well either, as a rule, that the external source of fresh air shall be at the ground level, because of the liability to take in injurious dust.

Causes of movement of air, and rates.

3. In the third group the most important fact, with reference to natural ventilation, is this—that, except as caused by fans, blowers, and other mechanical means, movements of air result from differences in weight of air at different temperatures, warm air being expanded air, and therefore lighter than cold air, which is denser,--in other words, heavier. Accordingly, warm air rises when its place is supplied by colder air; and cold air tends to fall in under and to displace warmer air. The rate of this movement of air depends upon the amount of the difference in the temperatures of the two bodies of air, and upon the height of the two columns of air—the displaced and the displacing columns of air. I have here a table, taken from Parkes' Hygiene, stating the rate of movement of air under different conditions of temperature and height of column. I will not undertake to read the entire table, but will merely state a few of the conditions and resulting rates of movements.

Table to show the Velocity of Air in linear feet per minute. Calculated from Montgolfier's formula; the expansion of air being taken as 0.002 for each degree Fahrenheit, and one-fourth being deducted for friction. ***(Round numbers have been taken.)***

Height of column, in feet.	Difference Between Internal and External Temperature, stated in degrees Fahr., 3 to 30 degrees.																							
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	30
10	88	104	114	125	135	144	153	161	169	176	183	190	197	204	210	216	222	228	233	239	244	249	254	279
11	92	107	119	131	141	151	160	169	177	185	192	200	207	213	220	226	233	239	245	250	256	261	267	292
12	96	111	125	136	147	158	167	176	185	193	201	209	216	223	230	237	243	249	255	261	267	273	279	305
13	100	116	130	140	153	164	174	183	192	201	209	217	225	232	239	246	253	259	266	272	278	284	290	318
14	104	120	135	147	159	170	181	190	200	209	217	225	233	241	248	255	262	269	276	282	289	295	301	330
15	108	125	139	153	165	176	187	197	207	216	225	233	241	249	257	264	272	279	286	292	299	305	312	341
16	111	129	144	158	170	182	193	204	213	223	232	241	249	257	265	273	281	288	295	302	309	315	322	353
17	115	133	148	162	176	188	199	210	220	230	239	248	257	265	274	282	289	297	304	311	318	325	332	363
18	118	136	153	167	181	193	205	216	226	237	246	255	264	273	282	290	298	305	313	320	327	335	342	374
19	121	140	157	172	186	198	210	222	233	243	253	262	272	281	289	298	306	314	321	329	336	344	351	384
20	125	144	161	176	190	204	216	228	239	249	259	269	279	288	297	305	314	322	330	338	345	353	360	394
21	128	147	165	181	195	209	221	233	245	255	266	276	286	295	304	313	321	330	338	346	354	361	369	404
22	131	151	169	185	200	214	226	239	250	261	272	282	292	302	311	320	329	338	346	354	362	370	378	414
23	134	154	173	189	204	218	232	244	256	267	278	289	299	309	318	327	336	345	354	362	370	378	386	423
24	136	158	176	193	209	223	237	249	261	273	284	295	305	315	325	335	344	353	361	370	378	386	394	432
25	139	161	180	197	213	227	241	254	267	279	290	301	312	322	332	342	351	360	369	378	386	394	402	441
26	142	164	183	201	217	231	246	259	272	284	296	307	318	228	338	348	358	367	376	385	394	402	410	450
27	145	167	187	205	221	237	251	264	277	290	302	313	324	335	345	355	365	374	383	392	401	410	418	458
28	147	170	190	207	225	241	255	269	282	295	307	319	330	341	351	361	371	381	390	399	408	417	426	467
29	150	173	194	212	229	245	260	274	287	300	312	324	335	347	357	368	378	388	397	407	416	425	433	475
30	153	176	197	216	233	249	264	279	292	305	318	330	341	353	363	374	384	394	404	414	423	432	441	483
31	155	179	200	219	237	253	269	283	297	310	323	335	347	358	369	380	391	401	411	420	430	439	448	491
32	158	182	204	223	241	257	273	288	302	315	328	341	353	364	375	386	397	407	417	427	437	446	455	499
33	160	185	207	226	245	261	277	292	307	320	333	346	358	370	381	392	403	414	424	434	443	453	462	506
34	162	188	210	230	248	265	282	297	311	325	338	351	363	375	387	398	409	420	430	440	450	460	469	514
35	165	190	213	233	252	269	286	301	316	330	343	356	369	381	393	404	415	426	436	447	457	467	476	522
36	167	193	216	236	255	273	290	305	320	334	348	361	374	386	398	410	421	432	442	453	463	473	483	529
37	170	196	219	240	259	277	294	310	325	339	353	366	379	392	404	415	427	438	448	459	470	480	490	536
38	172	198	222	243	262	281	298	314	329	344	358	371	384	397	409	421	432	444	454	465	476	486	496	543
39	174	201	225	246	266	284	302	318	333	348	362	376	389	402	414	426	438	450	461	471	482	492	503	551
40	176	204	228	249	269	288	305	322	338	353	367	381	394	407	420	432	444	455	467	477	488	499	509	558
45	187	216	241	264	286	305	324	341	358	374	389	404	418	432	445	458	471	483	495	506	518	529	540	591
50	197	228	254	279	301	322	341	360	377	394	401	426	441	455	469	483	496	509	522	534	546	558	569	623
Degrees Fahr	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	30

This table is taken from Parkes' Hygiene, American Edition, 1884, William Wood and Co., page 194. Its reading is easy, but may be illustrated as follows: Suppose the height of the shaft is 10 feet, and the difference in temperature outdoors and indoors is 3 degrees (as in the first line, first two columns) then the rate of movement of the air is 88 linear feet per minute. Suppose the height of the shaft is 14 feet, and the difference in temperature is 11 degrees; then the velocity of the air is 200 linear feet per minute. If thirty persons in the room are each to have 2,000 cubic feet of air per hour, all are to have 1,000 cubic feet per minute, then, under the conditions named, the cross-section of the shaft must have an area of five square feet. In practice, however, it is seldom that a foul-air shaft is not higher than 14 feet.

The foregoing rates are in ordinary straight shafts with no extra cause of friction; if the shafts are very small, or the friction unusual, the rate of movement is lessened.

It is a general fact, that must be held in mind, that each right angle in a shaft reduces the velocity of the air in that shaft one-half.

Given the number of proposed inmates of a room, the height of the shaft, and the difference of temperature between the in-door and the out-door air, then the sizes of inlets, outlets, and shafts, can be computed, by means of the data which have now been stated, allowing two thousand cubic feet of air per hour per person.

In this climate there is no difficulty in securing good ventilation in the warmest weather, because then windows and doors are usually open; nor in the coldest weather, because then the difference in temperature is so great between the out-door and the in-door air that very rapid movement of the in-door air is caused by permitting to be balanced against it a column of dense out-door air. The difficulty in securing ventilation occurs in the spring and autumn, when there is little difference in the temperature of the in-door and the out-door air. The ventilation of every inhabited room should be so planned as to be susceptible of regulation and especially of extension or expansion, by means of registers into flues and shafts of a size ample for times of slight difference in temperature of the out-door and the in-door air. The calculations for sizes of inlets, outlets, flues and shafts, should be made upon the basis of a very slight difference of temperature.

Each room should have Separate Ventilation.

One important principle which is perhaps most frequently violated by architects, contractors, and builders, was stated by Prof. R. C. Kedzie in the First Annual Report of the Michigan State Board of Health, page 95, as follows: "For successful ventilation I consider it essential that the foul air of each room shall enter a separate compartment in the ventilating shaft, and not one common shaft." The old "Ruttan" system, and the "Smead dry-closet system" both violate this very important principle. Some of the reasons why it is important that the foul-air shaft from each room shall extend separate and distinct to the outer air, are as follows: It is practically impossible to so control all the conditions that the pressure of air into two rooms shall always be the same; all openings into one room (except registers) may at some time be closed, while at the same time a window or a door into the other room may be open; one room may be on the side toward which the wind is blowing, while the other room is on the

side from which the wind is blowing; in such cases a common vent shaft is filled with air from the room into which the pressure of air is greatest, to the exclusion of the foul air from the other room, which is, therefore, not ventilated. An instance, at one of the State asylums in Michigan, will illustrate another reason: foul-air shafts from rooms on both sides of the building extended up to the attic, where they terminated in that common receptable from which a common shaft extended through the roof. During a wind, a window being open in a room on that side of the building on which the wind did not blow, a current of foul air was found to come down from the attic through the foul-air shaft and go out of the window, there being a constant circulation of foul air through the room, while the warm fresh air which was supposed to enter the room through a transom was not entering; the only air supplied to the inmate of the room being the foul air from the other side of the building, which might be not only impure with products of respiration, but also contain the germs of any communicable disease which like consumption might be present in the other rooms of the asylum. Such "back-drafts" are not uncommon in school buildings in which this principle under discussion is violated; and such "back-drafts" are believed to be especially dangerous where they come from excreta which is dry from which germs of disease may then be detached and float in the foul air.

After reading this paper, Dr. Baker added:

There is one point on which I would like to speak a little, and that is the distribution of micro-organisms, and not only by means of the ventilation in the room, but providing against them from out of doors, and I am led to speak of this because here in this city you have a school building where the method of disposing of the foul air is to pass it over still fouler material,—that in the privy vaults; I refer to the Smead dry-closet system. Unless it has been closed here recently, that is in use here now, is it not?

Prof. Shuart, Hillsdale.—Yes, sir.

Dr. Baker.—I spoke last evening on the subject of the micro-organisms which cause typhoid fever. These micro-organisms pass out of the body from the intestinal canal, and they cause the disease by reaching the intestinal canal of some other person. That seems to be an awful statement to make, but it is true; and, as a result, we have typhoid fever. You used to have it here in Hillsdale greatly before you had a general water supply, and it came from the draining into the water supply of the contents of the privy vaults. The danger to which I wish to allude is a different one. It is the danger of carrying up into the atmosphere these micro-organisms which cause typhoid fever; and we know now what we did not know some time ago, that these micro-organisms are not killed by drying; they remain alive for weeks, at least, and that is long enough to cause contagion. If you place this fecal matter in a vault in that school building and pass a current over it and dry it, as the plan is, then you may carry up into the atmosphere such micro-organisms. They go up into the air, and they come down in your rainwater from your roof; that rainwater is used in washing dishes, and in various ways, and there you have an opportunity for making a circle for the propagation of that disease.

This is only one of the amplifications that can be made to one of the groups, to which I have alluded in my paper,—the relation of ventilation to the spread of dangerous diseases. The State Board of Health some time ago advised against putting in any such system, and I do not think the State Board has changed its view. The city of Saginaw has recently

ordered out that method of disposing of the foul air of the schools of Saginaw. I think it would be well for you to examine the school building in this city, and I would suggest the question whether every bench and desk in that school building is not likely, at some time or other, to be covered over with these micro-organisms, from the back draft of the faulty system of ventilation that you have in your school room. I am led to make this suggestion because of a little experience that I have had lately at Ironwood. At Ironwood, I was told that the principal of the school was likely to die of typhoid fever; that three or four teachers were sick with typhoid fever,—teachers in that particular building; that several pupils were sick with typhoid fever. I found that in several families where they had only one person sick, that it was a young person who attended the High School; the younger children, who attended the other schools, the people who lived at home, did not have the fever, in a few such instances. That suggested to me an examination of the High School itself; and I went there prepared to learn just exactly which way the currents of air moved, and I had matches, and all that sort of thing, to see just where the currents were; but I found that those refined appliances were entirely unnecessary; that the instant I opened the door of the school room, the odor was so sickening that I retreated. I told the janitor that my own view was that he shouldn't risk his life in that place before airing it out thoroughly. That system of ventilation of a school building is only certain to act when a fire is going. In such weather as this, it is hard to convince the janitor of the High School building that it is necessary to keep a fire going in the basement all the time, while there is no school. Unless that is being done, there is frequently a backward movement of the air, because the air in the cold brick chimney is cold and it settles, instead of rising, as it would if the air were heated; and there is the danger of spreading the germs of this one disease. I don't claim that it will spread these other diseases; but the claim is that that one disease, typhoid fever, is liable to be spread in that way. I think that is all that I care to present at this time.

DISCUSSION OF THE SUBJECT OF VENTILATION.

LED BY E. E. MOORE, M. D., OF HILLSDALE.

Mr. President: It is almost too heating this morning to ventilate my own ideas upon the subject; but our subject is one of a great deal of interest; if it is not, it ought to be, and full of practical meaning to common people. I find in my experience among people that the question of heating and ventilation, if not understood, is greatly neglected. A physician will pass into a school room, or into a house, and come in contact with a great many odors, come in contact with air that is impure, that has a lack of oxygen; there is too much carbonic acid; not only that, but we come in contact with the odor of animal matter, the evaporation, we might say, from the body. I might say that man's own breath, almost, is the worst thing for him. We find this especially dangerous in the communities of the poor. Now, I don't think that the children sent to our public schools suffer more, perhaps, than they do at home. Of course, they have the advantage of good ventilation in poor houses, through the cracks in the doors and windows; but that is imperfect ventilation.

The questions of heating and ventilation are almost inseparable; you

can hardly have good ventilation without good heat; and it is almost impossible to have good heat without perfect or good ventilation; and I am glad the doctor spoke in his excellent paper—although I would be willing to give up all the time I have this morning to the doctor, and let him carry his subject a little further, and touch upon other points. I know he would be perfectly willing to do it, and very capable; I would have been glad to have given the time entirely to the doctor to discuss further this subject; and I will say, also, that I was well pleased that he touched upon one of the greatest evils that I think Hillsdale has ever been subjected to, the use of the Smead system in our public schools. During the past winter, I have had a little experience; I have visited the schools several times, and in going into the school buildings I could detect odors there that were not natural to the building. In speaking of it to our citizens, many of them thought it was not the case; they couldn't smell anything, frequently visited the buildings, nothing was out of order, and our citizens and people generally supposed that the system was perfect. Now, as I understand the system, there is not so much danger in the ventilation, in the Smead system of ventilation, as there is in the dry-closet system. As the doctor illustrated and spoke so plainly about contamination from typhoid germs which on a reduction of temperature are carried in the currents of air into the rooms of the buildings, under such circumstances we must get bacteria. The possibility, or the probability, of the excretions of the body being thoroughly dried, is absolutely ludicrous; for any one visiting these buildings with the dry closet can readily see that the most of the time, even when the conditions are the best, there is a great deal of excreta that is not properly dried; and then, again, if we consider not only the danger from contamination, but the impure gases arising; I believe Mr. Smead has said it is diluted by a blast of air, so many cubic feet per hour. But it is a well-known fact that the bacteria cannot be diluted, and I presume they leave the question of the bacteria to the dilution, without any regard to disease.

As I understand it, here we are within one block of a good sewer; and why the city, and those that have this thing under control, haven't attached the closets of our public school to the sewer, is a question I haven't been able to decide. We have this vile arrangement in our public schools, that bleaches out the cheeks of our children, makes them pale and nervous, reduces the vitality and resistance to disease, gives them coughs and colds, subjects them to all kinds of disease and especially, as the doctor has mentioned, to typhoid fever, where we have cases of it, as we have had in the past two years here in the city in the school, and coming directly from the schools.

It is a well-known fact, I think, in our own school, that the process of ventilation is imperfect. As the doctor expressed it, we had to have so many cubic feet of air to each pupil, and so many square feet of area, proportioned to the number of pupils. Now, a room 35 feet square, or 20 feet square, perhaps, would be large enough for 25 pupils, if the column of foul air that passed away from the room was sufficient. Where there are 35 in one room, a room should be ventilated with a ventilating shaft at least 20 inches square, and I doubt very much whether that shaft is sufficient,—whether the ventilating shaft is large enough.

The greatest trouble with our heating, in private life, most of us heat with ordinary stoves. Now, if we get too hot, so that it is necessary to have a certain amount of moisture in the air, to be healthy, if air is heated, it is

burned, so to speak, and it comes to us dry, parching the mucous membranes of the nostrils and of the throat, when it gets that way, the condition of the air is wrong. Now, the ordinary condition of school buildings, where we have them heated by stoves, around the stoves it is perfectly scorching; the air is bad; the children in the back part of the room are subjected to the cold. There is another thing; there is a difference of from 15 to 20 degrees between the feet and the head, which, you can readily see, is dangerous to health. In a perfect method of ventilation, we must have no more heat in one portion of the room than another; we must have no dangerous currents of air, have plenty of fresh air, properly moistened. There are other points upon this subject of interest, that I will leave to those that can discuss them better.

Mr. Goodrich, Hillsdale—There is one question I would like to ask, and that is this. I supposed, in this Smead system, not only was there a current of hot air passing over the excreta, but I supposed that every day, at least, there was kerosene oil sprinkled over the excreta, and flame applied, so that by that means it was disinfected, as you might say, by heat, rather than by the hot-air column. I supposed the plant of the building, as you may call it, was built with a circular form connected with the chimney, so that to this excreta, heat could be applied, and by that means kill the germs.

Dr. Baker, Lansing—Well, the reply to that would be that it is a question of fact, as regards your school here; but it is not generally the fact. That is not done in those that I have examined; I have not visited this school; I didn't know that I should speak on that subject, especially; but that is not the common way. Some recent "dry closets" put in by the Smead people have provision for applying the fire, and burning the contents, but it is done once in a month or three months or six months or a year; once a year was the way it was generally done at Toledo; that is the home of the system. I think if you find it is done every day or every week in this city, it is an exception. Some one here connected with the school board could answer the question, perhaps.

Mr. Goodrich, Hillsdale—I understand there was a question raised about the working of the system, after it was put in, it didn't work just right; chimneys were extended higher, and the plant was changed into a sort of circular form, and as I understand, the excreta was to be burned by means of kerosene being sprinkled over it and set on fire. I may be wrong, I may have the wrong impression, but that is the impression I have of the system as in use here.

Prof. Shuart, Hillsdale: I would like to say a few words about our system of ventilation, and the closet system here. I have been in charge of a number of schools during my work, and, really, I have looked upon the ventilation here as perhaps the nearest perfect of any that has come under my supervision. I have often thought, however, that very much of this good working of our system is due to the foresight and attention of our janitor, as he studies this very closely. There have been very few days since I have been here that I have detected what I considered a back draft. Occasionally I have detected foul air in the rooms, but quite as frequently as otherwise I have found this to come from the clothing of the children. In one or two rooms in our schools where complaint was made by the teacher and by some of the pupils, and I have investigated, I found that there was another cause of the bad odor in the room which at first was laid to the system. I came into Hillsdale very much prejudiced against the

Smead system; but today, after having been here three years, I must say I believe that the air breathed by our children has been better than I have known it in other places where I have taught, from the old schoolhouse in the country up to the High School. However, I can conceive that if the janitor did not understand the working of the system thoroughly, the most pernicious results would follow. The excretions are burned nearly or quite every day. As to the application of kerosene to burn the foul material, I don't know how often that is done; in fact, I know that considerable kerosene is used about the building, and I suppose that this is done quite often. I often talk with our janitor, and he takes me through and shows me the working of the system; but I must say, in all fairness, that he understands it very much better than I do. There was a time, I think it was for about one week, that upon entering the high school room I detected foul air; and on speaking with the principal of the room, I found that he noticed some difference in the actions and looks of the pupils, and the work done; setting ourselves to work to find out the reason of this, it seemed to be from the sash opened below, consequently the working of the system was out of order. On my calling on the teachers as soon as this was discovered, and saying that the sash must not be opened under any consideration unless so directed by the janitor, it did away with this. I have been very much interested in what has been said here, both last night and also this morning, and I think I have received helpful hints. I really wish here in our city there might be a thorough inspection made, to see how far we are liable to what they are suffering at Ironwood. I want to say, however, as I am speaking, that the health of the children in the schools here has seemed to me exceptionally good; I have remarked this to my teachers, I have so said to the patrons of the school; there have been the fewest severe colds of any school that I have ever had supervision over; the fewest cases of lung trouble, pneumonia, or anything of that kind. Hillsdale has had a reputation along the line of diseases like diphtheria, scarlet fever, and so on. Yet since I have been here, during three years, there has been less sickness therefrom than in any other place where I have taught. We have had a few isolated cases of scarlet—something; I don't exactly know what. In looking this matter up with the health officer, from time to time, as my duty requires, in one or two cases he thought it advisable not to allow these children to return to school, and we have an arrangement whereby they are not to return until he sends me word to that effect; but in the cases of scarlet rash, or whatever it may have been, this winter, and the German measles, or whatever it was, the pupils returned after a day or so, and no bad results have followed. In fact, there has been no contagion, comparatively, in our schools. In justice to the Smead system I say these things this morning. I notice that in various places, especially in Detroit, Ironwood, and Saginaw, there is much said against this system; and so, ladies and gentlemen, I must say very frankly that I give the credit in our case to the wisdom of the janitor, Mr. Castle.*

Prof. W. H. French, County Superintendent of Schools, Hillsdale.—No one questions the fact that this subject is a most important one, and one that is too frequently neglected, except at meetings of this kind. A few people appreciate the dangers arising from imperfect ventilation, but the masses seem almost oblivious to the fact that disease and death await them

[* A visit to the school building by the Secretary of the State Board of Health, impressed him also with the fact that the janitor kept the closets burned out clean, and generally the building showed much more care than such buildings usually do.]

from inhaling impure air. Go into our homes and our schools, and you will soon become painfully aware that oxygen, the life-giving element, is wanting. In my opinion, lighting and ventilating go hand in hand, and I shall speak briefly of both.

The site of the school-house should be a dry, airy place, with chance for plenty of sunlight.

Ignorance or stinginess, and sometimes both combined, is the cause of school-houses being put in unwholesome places and provided with small windows and no means of ventilation. Building committees should see that the light enters the room from the rear and side, and the window area should be at least one-quarter the floor area. The windows should be provided with shades so as to regulate the amount of light on bright and on dark days. The shades should lower from the top instead of being raised from the bottom, so that the light may fall upon the desk and books and not in the pupil's eyes.

I believe that improper lighting is the cause of weak eyes in school children in many more cases than is over-study, which is the cause usually assigned.

The inside walls should be smooth so as to afford as little lodgment for dust as possible, and they should not be papered or covered in any way so as to interfere with the diffusion of gases, which forms no inconsiderable factor in ventilation. They should be tinted with some color, as light blue or brown, so as to avoid strong reflection, which is very trying to the eyes.

Very few private houses, school-houses, or churches are properly ventilated.

When we consider that the ratio of CO_2 to pure air should not be less than 1 to 500, and that each person should be allowed at least 20 square feet of floor space, and 400 to 600 cubic feet of air space, we find that few houses come very near to perfect conditions of ventilation. Many are ventilated by stoves or furnaces from which, when overheated, the carbonic oxide and carbonic dioxide, both poisonous to the human system, escape rapidly and vitiate the air of the rooms where they are located. Steam heating is undoubtedly the best, but in any case there should be flues at the floor, adequate to remove these poisons, or the persons who stay there will be injured.

I have seen rooms heated to excess by stoves and furnaces where the openings were at the ceiling and about two inches by four inches.

I know of one church heated by a furnace where the so-called pure-air registers are at the back of the room and open into the furnace. The heated air rises from the furnace and cools and is drawn back through the pure-air registers to the furnace and so on, the people in a two hours' service being obliged to rebreathe this poisoned air many times, as no air from outdoors gets into the room, except as the doors are opened for the ingress or egress of people. Some people were angry with me when I told them they had no ventilation or worse than none, and some went so far as to say that the air was purified by re-passing through the hot furnaces.

The Creator has provided an abundance of pure air for our use, and I believe that we commit a sin when we poison our systems with the foul, fetid stuff we find in many of our churches and school-houses.

I believe that something ought to be done to relieve the prevailing dense ignorance on this subject.

Stoves can be bought that are provided with ventilating apparatus, jackets and pipes to conduct in the pure air, and then when it is heated,

throw it out into the room. Architects understand how to ventilate a house, and if the people are willing to have it done and to pay for it, there is no reason why the air inside a room should not be as pure as that outside.

But when we have all these appliances in place we must remember that they will not run themselves. They must be cared for and regulated. The janitors of our public buildings, and the teachers in our schools, and the parents at home must be constantly on the alert to detect impure air, and to remove it. Say all we may on this subject, and it will do no good unless we stiffen our backbones and do what we know ought to be done.

Prof. Delos Fall, Albion.—I have just a word or two to say as a part of this discussion. I was very much interested in Prof. Shuart's testimony as to the effectiveness of this method of heating and ventilation in the high school. But I want to utter this thought in connection with that. We say that the chain is no stronger than any of its links. If we want to test a chain as to its ability to sustain stress upon it, we should measure it by the stress that the weakest link in that chain would be able to bear. If the Smead system is such that for one day or for one week or for one time it fails to work, and there are back drafts when there should be drafts in the opposite direction, and if that one time happens to be when these germs of typhoid fever are in the air, then we have that load upon us, and have the responsibility, even for that one time, of adopting a system that will make impossible such a case as that. We held a sanitary convention similar to this at the city of Alpena. There was to be a paper on ventilation by a resident of that city who had opposed, with considerable vehemence, the Smead system. The Smead people understood it. They sent their expert there to see that everything there was running the right way. He went over to the high school building early in the morning, built his fire in the ventilating shaft, and left the building just as our Board, or some members of it, were coming into the building. We first interviewed the janitress of the building, and she said that very often the drafts were in the wrong direction, that the stench was fearful, that, overcome by the ill effects of it, she had herself to go out of the building to get fresh air, and that there had been certain odors which no doubt are perceptible here in your school-room; but we went in to satisfy ourselves; and by the simple process of holding a handkerchief to the ventilating shaft, and by examining the temperature, and in various ways, we ascertained the directions of the movements of the air. We found the air coming in where it ought to go out, and going out where it ought to come in. We found in these rooms the air reversed on that particular day, when the expert of the company had preceded us, and, as he supposed, fixed it all right, made it work as it ought to work. Now, that is a little bit of experience that, it seems to me, is very strong proof that there are times, when the system is liable to produce bad results. If it produces results one day that are bad, one week that are bad, then I say, banish it forever; and in view of the fact that has been brought out here this morning, that your sewers are in such relation to the high school that the fecal matter could be washed into those sewers, it seems to me there is no excuse whatever for the putting of the fecal matter of the vaults in connection with the draft of air which is conveyed to the school rooms. We have a church in my own city heated and ventilated by the Smead system. There isn't any connection with the vaults, and when the system works, it works splendidly, and the air is as pure and fresh inside as it is outside; but just week before last, at the time of our commencement exercises, when the building was crowded, there was a

very marked absence of fresh air, everybody commenting upon it, and the same air was breathed over and over again. Some one made investigation to ascertain about it, and it was found that the hard-headed janitor had refused to build any fire in the ventilating shaft; he didn't see the necessity of having a fire on a hot June day; it was nonsense to go and build a fire in that shaft, and he was in command and proposed to have his own way; and the result was that the beautiful system wasn't working at all; and everybody was feeling the effects. The single point I want to make is, it is a good system if it works all right, but if it is such a system as has its times of not working right, as sanitarians, as parents of children who have to go and breathe that air over and over again all their lives I was going to say,—well, a third of their lives is spent in the school room, then I say we have a duty to perform, which we cannot escape. Let me enforce that idea a little bit. Twelve years is the average school life for children in our schools. Thirty-three years is usually spoken of as the average duration of life. Twelve years is then, on that basis, more than one-third of the life of a person, spent in the school room; I say that we need to be particular about the character of the air that our children breathe during those twelve years of their lives.

Dr. Moore, Hillsdale.—Just one question. I would like to ask the Professor, in his paper on ventilation, how he gets ventilation from steam heat. From the steam pipes in the room, he gets perfect heat; but how does he get perfect ventilation?

Prof. French, Hillsdale.—My judgment was—I don't claim to be an expert in the matter of ventilation, but in my judgment the matter of ventilating, in such a case, would be by having a flue built to compare with the size of the building, ten by twenty inches, or twenty inches square, or twenty by forty inches, whatever size is necessary, coming down to the floor, and that connecting with the chimney, of course, with as few turns as possible, so that the impure air may be drawn out at the floor. I have had charge of a school in one place where the heating and ventilating was done in that way, and I found it a very good system of ventilating. These larger flues at the side of the room would create the draft, and there was a grate there in which we kept almost continually burning coal or wood, to hasten the draft of impure air away from the floor.

Dr. Baker, Lansing.—And the fresh air comes in where—what provision is made for fresh air?

Mr. French, Hillsdale—Take the case I am speaking of, it was not steam heating, but it was a furnace-heated room. In such a case, there would be the pure-air flue, probably at the ceiling. I may be wrong in that; I would like to ask the question myself. It is claimed that steam heating is the best. I can see readily how the impure air could be conveyed away, but I don't understand the method of supplying fresh air in a steam-heated building.

Dr. Baker, Lansing.—The one who persuaded me to ask the question seems to insist that I continue it a little. I would say that the way to get fresh air by that method is not to have that method at all. I don't believe in having the heat from steam pipes in the rooms; I think it is a vicious system. If we are to have the heating by steam, which I agree with the Professor is the pleasantest, perhaps, unless it is the hot water, the steam pipes should not be in the room, but should be where the fresh air, in coming from out of doors, shall pass over them into the room; that is

called the "indirect" system. The method of heating by steam, having the coils in the room, is a vicious system, and there is no good way of ventilating in such a way of heating. You can smell the results of it as soon as you enter the room; the exhalations when the pipes are cold are condensed on the pipes, when they are heated again, they give them off; but the main difficulty is that, in that method of heating, there is no provision for fresh air. The "direct" method of steam heating is vicious, and ought not to be employed, as a rule, anywhere. The steam coils should be outside of the room, and the fresh air should pass over those coils into the room, and then, in the proper system, the air at the floor level is carried off.

Prof. Delos Fall, Albion.—With that system of heating, by steam, the system of ventilation is an extra affair, and must be worked out by itself; the heating is not a system of ventilation; you have got to provide an extra place for your air to come in and go out. You can provide that, of course, you can have a place for the fresh air to come in from outside of the building, and you can have a place for it to go out at the floor level, with the coils in the room; but the air comes into the room when its draft is often dangerous, and I see no way of having a proper supply of fresh air in the "direct" method of steam heating.

Dr. Moore, Hillsdale—I would call attention to that subject, because several of our houses in this city are heated by steam, without any provision being made for ventilation, and it is exceedingly important here, because many families suffer from it, and do not know what is the matter. And, then in regard to the Smead system; I am glad, I am pleased that it has been brought up here, because we need to have it brought to the attention of the public. Notwithstanding our good janitor and our excellent principal, we have a faulty system there; and the excreta in the basement — I would as soon have a corpse, almost, in the basement. There is provision made, or can be made, by a little expense, to connect with the sewer, and get rid of the fecal matter we have there; the ventilation outside of that is good.

Mr. Goodrich, Hillsdale—I would like to ask if there is much difference, as far as the heating and ventilation is concerned, between the steam heat and the hot water system?

Dr. Baker, Lansing—In the coldest weather, there is perhaps an advantage in having the steam; but there is a disadvantage in the spring and fall, when one needs a little heat, and not very much. If you have to heat the pipes up to 212 degrees before you get any heat, and then all at once you get great heat, that is not a very pleasant way to do. If you have the "indirect" method of heating, by means of hot water, you have the ideal system. It is expensive, perhaps; but when the fire is built and the water in the boiler is heated a few degrees, the circulation commences, and the incoming air is warmed, little or much as you desire; that is the great advantage of heating by hot water, that the heat is more easily suited to the temperature of the air in the spring and autumn months. In the coldest weather, it is an advantage to have the hot water line below the radiator, and so heat by steam; that is a method that is easily accomplished by simply lowering the water in the boiler; and instead of passing the water through the coils, pass steam through; that can be done in the cold weather, and in spring or fall the hot water can be used.

DRAINAGE: SURFACE, SUBSOIL, AND SUBTERRANEAN.

BY HORATIO P. PARMELEE, HILLSDALE.

At some time during the Huronian Period, the earth's crust first became cool enough to retain in the form of hot, sour water, the moisture that fell upon it;—by the contracting of the surface the oceanic sediment was pressed upwards until there was land above the water, when nature's laws, that still govern drainage, were for the first time enforced. Then only the most simple forms of organic life existed; age after age came and passed away, before the first man noticed that water was ever trying to seek a lower level, in the Garden where for a short time he was general manager.

From Adam's time until today, how best to use the water that is beneath and above us has been a question of the utmost importance. The world's supply of water is both superficial and subterranean, and so abundant is it, that if the land was evenly leveled every portion of the earth's surface would be covered over two miles deep with salt and brackish water.

A portion of the snow, hail, and rain that falls from the clouds, sooner or later percolates into and through the soil, often forming underground streams, which are fed the same as surface rivers; they follow the dip of all tilted strata, which never fit so tightly together but that water can flow between them. They may also run for a long distance upon a bed of hard pan, of the softer clay, of marl, or even a stratum of gravel that possibly lies beneath loose detritus, whenever the deposit was made by transporting water that contained in solution iron, silica, or lime.

Countless thousands of lives have been lost through ignorance of these duly proven facts. Wells that tap these underground streams are often sunk below their beds to insure an abundant supply of water to another hard stratum, so that the lower part of the well becomes a kind of cesspool that takes on deposit the most of the organic matter and all the heavy material carried in the water of the first stratum over which the water flowed; the pump takes this impure compound from near the bottom of the well where the dreaded typhoid bacteria abound. Well water, is quite sure to be sickly water if drawn from the depths when the well has been dug through stratified rock, or glacial drift that contains a water-holding stratum. If such a well is located within 150 or 200 feet of a cess-pool, out-house, barnyard or hog-pen, do not use the water. It is a decided mistake to think that sand and gravel are safe filters; they may be for a very short time; but do not trust them to purify *swill* and to make it fit for any vertebrate animal to drink. Do not think that your cesspool is safe because it was dug in loose sand or gravel; for only a few inches below its bottom there may be a hard, solid layer of such composition that the filthy slops cannot filter through it. There are year after year more deaths from typhoid fever when the water in wells is lowest. The death-rate from using impure water is well shown in Munich, where it decreased greatly after the city had a good system of sewerage, and a good water supply.

It is unwise to throw filthy water upon the surface near the house; part is taken up by evaporation, part sinks into the ground, the balance dries, and the dry germs are more dangerous than the others.

Do not think because the water in your well is *cold*, that it is pure, f[illegible]

these dreaded micro-organisms develop and flourish in water only eight degrees above freezing.

Sewer gas from imperfect drainage may contain typhoid germs.

The milk from cows that drink water that contains typhoid bacteria may cause typhoid fever, which fever, as is quite well known, is extremely communicable, a single kiss from a brother to a sister having been known to communicate the disease.

Undrained ponds often give the favorable conditions needed to develop the germs that make trouble, sickness, and death, that might easily and cheaply be avoided.

The " Borrow pits," as the railroad contractors call them, are often left with a small partition of dirt to keep out the water *from* the next pit if it should rain. When dug in the sand, as a rule, the water does not remain long in them; but when in clay, they are unsightly; breeding-places for mosquitoes and other bloodthirsty or injurious insects; but, above all, these pits are dangerous to the public health, for when they dry up the organic water-soaked matter sends out malaria and bacteria. Again, these "borrow pits" are sunk in low ground and in swamps, and left undrained. Would it not be well for the State drainage law to be strictly enforced, and these companies whose road-beds are so built be compelled to properly drain each side of their tracks.

The needed local drainage will be discussed by others.

May God grant that the rapidly-subsiding waves of superstition may be stilled by the oil of scientific truth, boldly and persistently applied, and that the dark clouds of sanitary ignorance may be dispelled by the clear and steady light of true knowledge.

DISCUSSION OF THE SUBJECT.

LED BY HON. FRANK WELLS, PRESIDENT OF STATE BOARD OF HEALTH, LANSING.

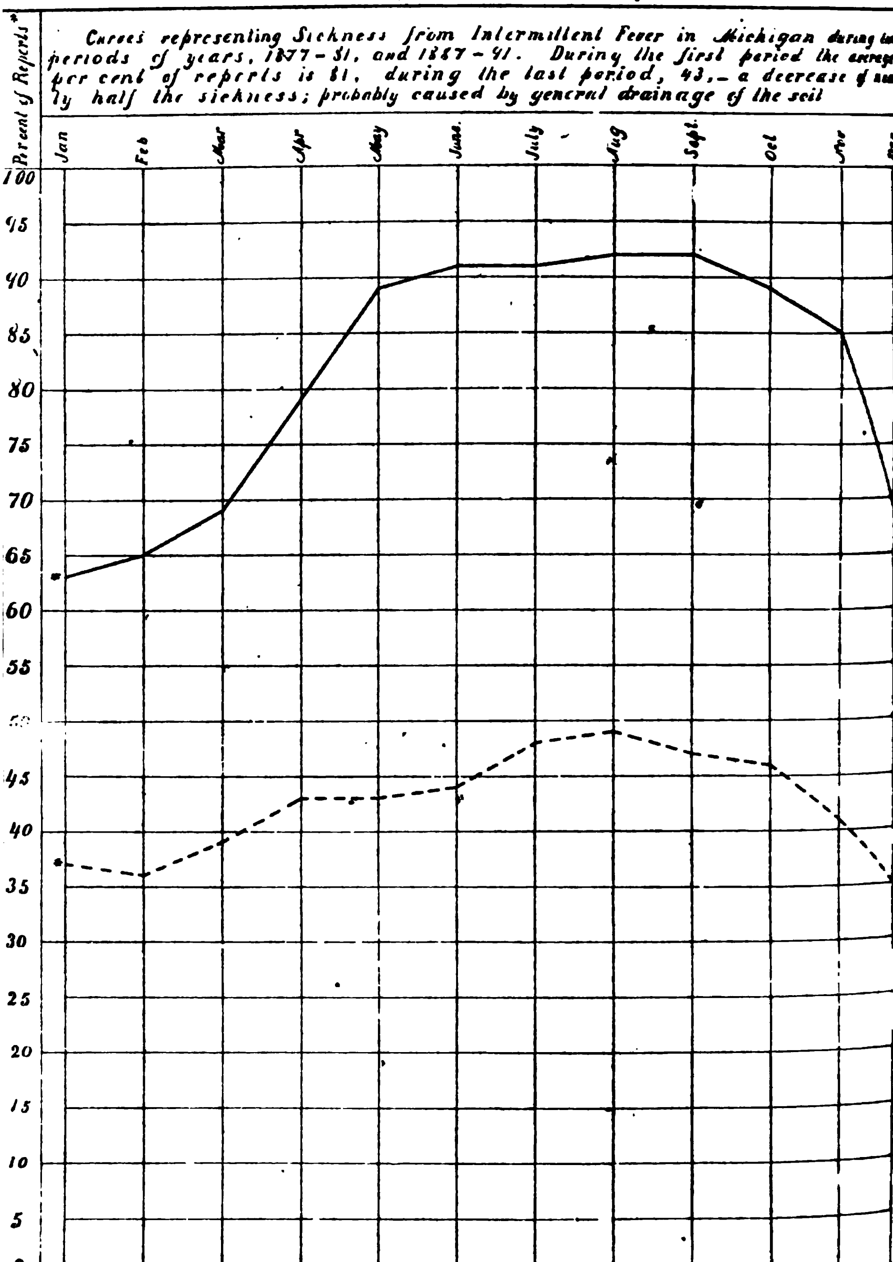
I did not know, before coming here, just how this subject was to be treated. The subject of drainage is a very extensive, as well as a very important one, and it naturally suggests the question of sewerage; but that question, I believe, is to be discussed here, under some other title or department, so that in the few words I shall say in opening this discussion, I shall confine myself to the question of surface and subsoil drainage, and to only a portion of that.

In towns, the drainage from storm water can safely be left to surface drainage, as a rule. Where streets are well paved, the storm water can be carried off to its proper level in this way with safety. Where a sewerage system exists, and you have it in partial existence here, the question of whether the storm water shall be carried off by the sewer or not must be decided. Usually in large cities, the storm water is carried off largely by the sewers. The system that is recommended by Waring, who is recognized as one of the best authorities in this country on the subject, is a divided system; that is to say, a small sewer in the middle of the street, and either surface, or underground drains on each side of the street for the storm water. By using a small sewer it can be very readily flushed by the storm water, or otherwise if necessary, and the current in it being much more swift than in a larger sewer it is less liable to become clogged.

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

NO. 15.—DECREASE OF SICKNESS FROM INTERMITTENT FEVER, IN MICHIGAN.

Curves representing Sickness from Intermittent Fever in Michigan during two periods of years, 1877-81, and 1887-91. During the first period the average per cent of reports is 81, during the last period, 43,—a decrease of nearly half the sickness; probably caused by general drainage of the soil



Sickness from Intermittent Fever, 5 years, 1877-81 ———— Sickness from Intermittent Fever, 5 years, 1887-91 - - - -

* Indicating what per cent of all reports received stated the presence of Intermittent Fever then under the observation of the physicians reporting

Over 17,000 weekly reports of sickness were received for the first period, and over 24,000 for the last period

The State of Michigan, in times past, as most of you older residents will remember, suffered greatly from a lack of drainage. In the early days, before the woods were removed, or any but natural drainage existed, there were large tracts of marshes and low ground, which the summer sun never dried, and which were the prolific sources of the intermittent fevers and fevers and agues of that time. Most of you will remember that in those days few meals were eaten in any home that were not accompanied by the quinine bottle. At the present time, so thoroughly has the State been drained that great changes have taken place in this respect, and the diagram* that is now being distributed by Secretary Baker will show that, during the period between 1877 and 1881 the sickness reported by observ- servers in this State from intermittent fever, was about double what it was during the period included between 1887 and 1891—nearly double the number of observers in this State reporting to the State Board of Health observed during the first period intermittent fever than during the later period, ten years later. This was undoubtedly owing almost entirely to the draingage of swamps and low places in the State of Michigan. That such places still exist is the cause, undoubtedly, of this disease still continuing to a moderate extent in the State; and it is believed by sanitarians that when this State, the entire State, is thoroughly drained, these diseases will almost entirely disappear. I think this is a question which interests you citizens of Hillsdale at the present time very much.

During a drive, we enjoyed this morning, to your water-works, we observed what you call a mill pond. It consists largely of a low, marshy piece of ground, filled with decaying vegetation, right in the midst of your beautiful city. It seems to me as though it cannot be otherwise than that you must have more or less malarial fever here from this cause during the hot months of the year. It is besides an unsightly place, and I would most earnestly recommend that every effort on your part be made to have it drained. The malarial diseases from such marshy and low places, where the evaporation from the water is charged with organisms unfriendly to health, are sure to continue until thorough drainage is established. After drainage, the soil becomes aerated, and another class of organisms take the place of the first, a class that is not unfriendly to human life. The decomposition of vegetable matter in these low places is the food upon which this class of disease organisms exist, and though their characteristics have not been as thoroughly studied as many others, still there is no question but what they are the cause of that extensive class of diseases known as malarial. As I said before, it seems to me as though the citizens of Hillsdale must, with a breeding-place for this class of organisms right in their midst, suffer more or less from their inroads.

The question of subterranean drainage of marshes is one that I presume very few of you have had your attention called to. Prof. Fall has recently had some experience in this matter, and I believe you will be more interested in what he may say in regard to that than in anything that I could say concerning this method of such drainage.

In opening this discussion I have desired to call your attention especially to that one foul spot that you have in your midst, as it is the only phase of the subject of drainage that I know of, aside from the question of sewerage, in which your people of Hillsdale are interested.

* Diagram No. 15, page 52.

I hope the further discussion of this question and the kindred one of sewerage may result in the City of Hillsdale becoming as free from unsanitary conditions as she is beautiful.

Prof. Fall will you now state to the Convention what you know about the subterranean drainage of marshes.

Prof. Delos Fall, Albion.—Mr. President, we have one member of our board, who is not present with us here, who has a very happy faculty of telling the citizens of the towns where we hold these conventions that they are the most perfect people in the world; that their conditions are about perfect. There is no danger whatever for the people of Hillsdale, he would go on to say, and congratulate you on your splendid sanitary conditions; and then he would go on with great minutness to describe the condition, the fearful condition, that exists in other cities, leaving the audience, of course, to draw their own comparison between the actual condition as they know it to be by actual experience, and as his fancy pictured it in his beautiful peroration. Now, those that are here have not that faculty of smoothing things over; and if we speak plainly the things we do see, it is because we think it our duty. The object of holding a sanitary convention in Hillsdale, I presume, ought to be the calling attention to matters that concern personally every one of you people living in Hillsdale. This matter about which I speak does not pertain so much to Hillsdale, I think, as it does to Albion, the place where I live, and other places situated as we are with reference to the source of water for the public water supply.

You have a lake here from which you draw your water, and the question with you would be a question of surface drainage of ground water, rather than subterranean water. The problem before you is to see to it that that source is not allowed to be contaminated from material dropped into it from the surface. I would raise one warning in connection with the lake; that is, that it does not seem philosophical to use a lake, like that out there, for the public water supply, and at the same time boom it, to use the expression, for a summer resort. It can't help but follow that the frequent use of the water for bathing, and for the dumping of refuse from those who camp out on its banks, from the large number that the railroad company hope to attract to the banks of that beautiful lake, that contamination will follow, and serious results creep into your water supply, and be used by the inhabitants of Hillsdale.

The subject to which Mr. Wells refers is this: Farmers in certain portions of the country have found a very effective method of draining swamps and low lands. I am sorry that I have to advertise it. I hope there are no farmers in the audience to advertise it to; but it is a fact which the inhabitants of the State of Michigan have to face as a possible contamination of water supply. They have found that by boring a hole of considerable size, six or eight inches, through the impervious stratum that holds up the water in these swampy places that are desired to be drained, down through this into the subterranean water, that very frequently the water will run from these surface ponds into this subterranean water; and I have seen a well lately where the suction of the water passing from the surface into it was almost enough to take a broom out of my hand as I held it in it; a strong current carrying off the water at a very rapid rate. At the time I visited this place, there were fifteen or twenty acres of land owned by a farmer there, covered by water, but it was going off at such a rate that in two or three days it would be drained off. It is a good thing

from his standpoint; he has reclaimed his fifteen or twenty acres of land, and he hopes to reclaim 100 or 150 that he has further on; but as a result, there is introduced into this subterranean water all the drainage from the surface of that swamp, and from his barnyards, and from his privy vault, and from the buildings of all the people around—all that matter falls into the subterranean water which only four or five miles away the city of Albion was drawing out, as they supposed, pure water for their water supply. Now, the depth to which the farmers have gone is only a little less than the depth of the artesian well from which we in Albion obtain our water supply. I presume Mr. Parmelee, with his knowledge of the stratified rocks, could go there and judge very accurately as to whether that drainage from that man's barnyard is or is not going directly into the source of the water supply of the city of Albion. If it is, it is no longer possible for us to obtain pure water. We haven't any beautiful lake, like the one you have here, to draw our water from. The question is, and it is a question which the State legislature must take hold of, it seems to me, whether or not for the advantage of the reclaiming of a few acres of land that personally benefits a farmer out in the country, the whole water supply of a city like Albion, and all those others that are hoping to get their water from that source, is to be ruined. The question has just now begun to be an important question, because farmers have just now begun to find out what they could do in this direction.

So there are a great many things we have to look out for; and if this convention shall have attained the result that we hope it will have, it will set the people here to thinking upon these subjects, and make them sympathetic with the discussion of these subjects, so that when the discussion is made public, you will sympathize with it, and you will be on the right side.

Mr. Goodrich, Mayor of Hillsdale.—I would like to ask a question of the President of the State Board of Health, if the mill-pond, that he speaks of, and low places that surround it and surround the town here, if they are polluted with bacteria from typhoid fever, and by the process of evaporation, the water evaporates, and the pond becomes low, and the cat-holes, as we call them, are dried up, if, it is possible for these germs, in the process of evaporation, to go into the atmosphere, so that there is liable to be a source of disease from those places, or must they come through the water supply? Can they come through our supply of air? Are they taken up by evaporation, and dropped in different places, and from that source get into our well water that we drink?

Mr. Wells, Lansing.—The question is a practical one, and nothing better than the experience that has been had can answer it. The organisms that produce typhoid fever are usually, if not always, connected with the water supply; they enter the body from that source as a rule, perhaps not always, but almost invariably. The organisms that produce intermittent fevers, or what are known as malarial fevers, seem to be of a different class; they prevail in the air, and experience shows, that they act in a peculiar way; and exist immediately in the neighborhood of water-logged soils, like, for example, the swamp or the marsh here in Hillsdale. Localities quite near such marshes may be comparatively free from these organisms, while on the side of a hill, perhaps half a mile off, they may exist and produce the disease; and then beyond that hill they may disappear. Experience shows all this to be true; and therefore there is no question but that, instead of contaminating the water supply, as the organisms that

produce typhoid fever do; the causes of malarial fevers are organisms from water containing decaying vegetable matter, that are breathed into or in some way get into the body, in a manner different from those of the typhoid organisms. In early days, when we had these intermittent and bilious fevers, we had comparatively little typhoid fever. After the swamps were to a large extent drained, these malarial fevers largely disappeared, and have been succeeded by the more fatal but distinctly different typhoid type of fevers.

Before sitting down, I wish to add a few words to what Prof. Fall has said in regard to your beautiful lake, and I earnestly recommend that some measures be taken to guard it from contamination. With a large hotel on its banks, and with the farm buildings, and others, which so generally occupy its shore, it seems to me as though there must be more or less danger; and while perhaps danger at the present time is not great, still, if one considers the experience of the little town of Plymouth, in Pennsylvania, a few years ago, where there was an outbreak of typhoid fever, caused by a single case of the disease, the excreta thrown upon the snow a mile or two away from the water supply, and this when the snow melted carried by a mountain stream into the water supply, and contaminating it so that there were hundreds of deaths from the disease—when you consider such instances, you cannot help but realize that danger may be lurking around your lake from the same cause, and that you cannot guard too well from contamination this main source of your water supply. In regard to your wells here which are likely to be contaminated by drainage, these certainly ought to be looked after, and all means adopted which science and experience can suggest to render them free from contamination so long as they shall be used.

Prof. Fall, Albion.—I would like to ask the question from the physicians who are here, whether or not there is a larger amount of the class of fevers that Mr. Wells alludes to, near to that mill-pond, than in places more remote from it in other parts of the city?

Dr. Moore, Hillsdale.—In my experience of ten years, Mr. President, I think the amount of malarial fevers is greater away from the pond than immediately in the vicinity. We are quite as apt to have malarial fevers and troubles among those who live half a mile away from it as immediately in the vicinity; that has been my experience.

Just one word in regard to our lake. I am glad that question has been brought up, for our own good. We know that typhoid fever exists in cities like Toledo, Lansing, Detroit, and other cities throughout Michigan, more than in our country place here. If we have two or three cases, there is no reason why we can't have typhoid fever germs—typhoid fever, on the shores of our lake. Just a few words as to our water works. It is perhaps not more than 35 feet down where they take the water from, a depth not sufficient to prevent taking the germs from the surface water; and frequently, in fact, we get surface water, as we all know from experience. In this way I have considered for several years that we were in great danger of having typhoid fever. We have been comparatively free from it, only here and there a few cases, so far as I have known; but those few cases have all scared us.

Mr. Goodrich, Hillsdale.—I would like to ask the doctor if those cases were among people that obtained their water supply from the lake, or from wells?

Dr. Moore, Hillsdale.—In my observation, it was more prevalent before

we had any water works than since. I have had, I might say, in the last two or three years almost no typhoid fever, or any cases that had any symptoms of complications of that nature.

Mr. Goodrich, Hillsdale.—I would like to ask if the prevailing fevers are not less numerous among those who use lake water than those who use well water?

Dr. Moore, Hillsdale.—I think that has been stated; yes. I think that is true; the fevers have been malarial.

Mr. Goodrich, Hillsdale.—I would like to ask the question in regard to the depth that these micro-organisms will live in, right in our lake, in our cold water. Now, it is a fact that our lake water is fed by subterranean springs, wholly; there isn't a stream of any magnitude whatever that flows into the lake; it is fed wholly by springs, and the water is extremely cold. You take the surface water where it will register seventy degrees, or sixty degrees, say, and go down forty feet, fifty feet, and the water there will register only about forty-three degrees. It is very cold. Now, I would like to know if it is possible—if it is the nature of these micro-organisms to seek the cold water, or to seek the surface warm water.

Dr. Baker, Lansing.—If I may be permitted to make a suggestion, it is this. The same idea has occurred to me, while I have been visiting the lake this morning, and it seemed to me that it would be a very simple thing to provide for the disposition of the excreta around the margin of that lake, in a very satisfactory manner. The water supply goes to the resort, as I understand, the pipes are laid there. Now, if, instead, of the ordinary privies around the margin of that lake, they had water closets, and pipes were laid, and a sewer constructed, to the buildings, that will carry off the excreta into the river this side of the lake and water supply, it would seem to me that that would be very satisfactory; and if that is not done, sooner or later, the calamity referred to by Mr. Wells will probably reach this city, that took place in Plymouth, Pennsylvania, where they had that fine water supply from a stream which all at once became contaminated. The typhoid germs will contaminate the water supply dangerously, even though they do not reproduce at the lower temperatures mentioned by the mayor. [At Plymouth, Pa., the germs were washed into the water supply with the melting snow.] It may be only one contamination; but one contamination is enough, as suggested by Prof. Fall. The discharges of one person in the case of typhoid fever would be enough to cause the calamity of a thousand cases of typhoid fever, if people use that water. That occurred at Plymouth; a similar instance occurred at Caterham, in England. It seems to me that it is of sufficient importance that the city of Hillsdale should regard the danger of the method of disposing of excreta on the margin of that lake.

With reference to the dissemination of typhoid by means of evaporation of the water from the mill-pond; I think, as has been stated by Mr. Wells, that so far as relates to typhoid fever, that can be disregarded. The experiments of investigators have proved that the evaporation of sewage leaves the bacteria, and the danger with reference to the evaporation of the excreta in the dry-closet system does not consist in the micro-organisms going up with the evaporated water; they don't go up until the excreta is dried; so that the danger from typhoid from the pond is not very great; and it seems to me that it is important that the disposal of excreta around the margin of that lake should be by water closet and sewerage, and the

sewer from it be brought down this side of the intake pipe of your water supply.

Mr. Goodrich, Hillsdale.—One question, now, about Dr. Baker's remarks about evaporation. There are many wells here in the city; people use a great deal of well water. Suppose the water supply in those wells derives its source from the pond, which likely is true, as there are many wells here that have the current coming into the well from that direction, would it be possible, with the nature of our subsoil, which is a slate rock, to get the germs of typhoid fever from that source?

Dr. Baker, Lansing.—I would answer that by a reference to the typhoid that occurred at Lausanne, Switzerland, where on one side of a mountain there were cases of typhoid fever; the discharges were thrown into a stream; that stream disappeared in the sand and gravel. On the other side of the mountain, lower down, at the town of Lausanne, two or three hundred cases of typhoid fever suddenly occurred. They occurred among the people who used the water that came from the spring. There were no cases there among any other people. The problem was whether there was any connection between the typhoid on the other side of the mountain and the typhoid at Lausanne. They had an analysis of the water at Lausanne first, to see whether there was any chloride of sodium (common salt) in the water. There was no appreciable quantity. They then took a hundred weight of salt and put it into the stream where it disappeared on the other side, and then analyzed the water in the spring, and found salt came through in great quantities. That showed that the water supply at Lausanne came through from where the typhoid fever had first occurred, that was half a mile distant. Then the question was as to the character of the ground through which that passed; the question of whether it was a rock, or whether there was a soil that filtered it. To determine that, they put a hundred weight of flour into the stream on the other side, and then analyzed for starch, on the Lausanne side. No starch was found, proving that there was not a direct and undisturbed flow of water, that there was a sufficient flow so that the salt in solution could come through, but the particles of starch could not come through. They concluded that the cases of typhoid fever were caused by the water that passed through. That answers the question, I think. I think it is a longer distance at Lausanne, it is half a mile and over that the typhoid fever passed through there, and some of the wells here are less than a half mile from the pond.

Mr. Cook, Hillsdale.—I would like to ask the question in regard to our lake supply, the doctor stated that the surface of the water—of course, the pipe goes down 25 feet, and it is impossible to get any surface water, as the pipes are now arranged. The water pipe goes down 25 feet below the surface. If there is any motion of the water, it is from the south towards the north. The water is taken from the inlet pipe up at this end, north of the outlet. As the mayor has said, the lake is largely fed by subterranean springs, with a few rivulets that run down from the farms, which are fed by these springs. With the current of the water, if there is any in that lake, from the south toward the north, taking water from 25 feet below the surface, and taking into consideration that there is no good bathing place at the head of the lake, where the resort is, and very little bathing done, it seems beyond question that there is no danger from typhoid fever, or from contamination from that getting into our inlet pipe. It would have to, it seems to me, come through the soil from the north side, the closets that they have, to get to the water; there is a difference

of 25 feet between that level and town. Of course, as you get this side of the lake, the tendency of the water on the ground is to flow this way, and not that way. It would be impracticable to dispose of the excreta by running it below the outlet of the lake, as the outlet of the lake is on the opposite side from the lake resort, and it would be much cheaper to take it directly north; it would save expense, for there at the gravel pit, the pipe would all have to go down a long ways, until you get this side of the mill-pond. Of course, I don't pretend to know anything about the subject, but it is quite a good ways to go extra, it would look to me.

Dr. Baker, Lansing.—The pumping of the water would of itself make a flow of water towards the intake.

Mr. Cook, Hillsdale.—Yes, but the source of supply is beyond, and it would naturally come from the source of supply.

Dr. Baker, Lansing.—Well, the source of supply of the lake is all around it. The rainfall here is how many inches?

Dr. Moore, Hillsdale.—Thirty-four or thirty-six inches of water.

Dr. Baker, Lansing.—There is three feet of water that falls on that resort. That all has to go somewhere; undoubtedly a good deal of it goes into the lake. In going into the lake, it goes through the filthy matter that is now in privies and around there. My recommendation is that that water be protected on its way to the lake, and especially as the fall towards the city is considerable. I say the lake water ought to be protected from the excreta around there, and it is perfectly possible to put a sewer in there and run it down this way; it has to go towards the city, but it seems to me that the sewer need not go past the city; it might enter the stream anywhere this lower side of the water works.

Prof. Fall, Albion.—If I may be excused for speaking again, I am sure the members of the State Board of Health do not want to be alarmists in any way or overstate or give information of such a nature about a thing, if it is unnecessary. We try to guard ourselves against that; but truth is truth, and we come here to seek that, and this is a most important question, and great deal of evil can spring out of a little matter. We held a sanitary convention once, in a city in this State, of considerable importance, where they were drawing water from a lake, similar to this. That lake, however, is a surface lake; it is not well situated, not fed by cold springs, as we are informed this lake is. I visited that lake just a few hours before making a little talk in the convention on the water supply. I had a talk with the engineer there. He told me of a man just a day or two before that he had seen bathing in the lake. Now, that man was afflicted with some disease; I don't know what it was. It was of an eruptive character, and the man went in there to relieve himself, and he left the rags and materials with which he had bandaged portions of his body in the lake. Now, it seems to me,—that is not a pleasant picture, and you will excuse me for speaking of it here; but it is a fact that may occur out here at this lake any day. It is a little bit alarming that the germs from that man's disease, whatever it was, should be washed into the water that is running into the city, and be partaken of by the inhabitants there. As I say, it is well that we should know about such cases, and guard against them.

Just recollect that typhoid fever is a disease that is peculiar to the adult portion of the community. It is just as likely to attack the most important man in your community here as any one else. I remember of making such a talk as this at a time when Mr. Gale (I speak his name

because you will know the importance of that man to our community, as he was at the head of the Gale Manufacturing Co., there)—when Mr. Gale lay at the point of death with typhoid fever. Well, now, it meant a good deal that that man should die because of a lack of spending a few dollars for the improvement of that water supply. Everybody said so. They said: "The death of Mr. Gale will carry off the industry here upon which the welfare of our city rests;" and I may say, as a corollary to that, that as a consequence of Mr. Gale's sickness with typhoid fever, we have a good water supply there. It may be just of that importance to the city of Hillsdale.

Dr. Baker.—I would like to supply the information asked for by Mayor Goodrich. Dr. T. Mitchell Prudden of New York, has made experiments on the typhoid bacillus, and has demonstrated that one freezing does not destroy the vitality of all the germs in a given lot. He has demonstrated that repeated freezings and thawings, one after another, will destroy them. That answers the question perfectly. The water in your lake at the level of the intake is not down to the freezing point at any time during the winter. There is no time during the winter that the temperature is low enough, or that the conditions are such as would cause the destruction of the germs of typhoid fever by freezing alone. One freezing cannot be relied upon to destroy them. [The greatest danger, ordinarily, from typhoid fever is in October, and then there would be no freezing whatever.]

FOURTH SESSION, FRIDAY, JULY 7, AT 2:30 P. M.

After a vocal solo by Mrs. Whelan, the following paper was presented:

DISPOSAL OF WASTE AND EXCRETA AND ITS DANGERS IN HILLSDALE.

BY L. A. GOODRICH, PH., C., MAYOR OF HILLSDALE.

Waste, or inert material in the animal and vegetable kingdoms, is as common and necessary as the life sustaining particles that constitute the integral constituents of animals and plants.

We live and subsist upon food both organic and inorganic, and to satisfy the demands and meet the conditions required by nature, we must necessarily draw largely upon highly-organized material found in the animal and vegetable kingdoms, and, as our systems can only absorb and assimilate a definite amount, there must be a great waste.

Argument is unnecessary to convince us that it is dangerous to health to allow this waste to accumulate in, or in the immediate vicinity of our dwellings. Too often is it customary, though abhorrent to our good judgment, to locate the depository of excretal waste under the same roof as our dwellings, or in such close proximity that danger arises from foul gases and other products of putrefaction. It matters not how deep the excavation (the deeper the more danger), as the power of the soil to disinfect and purify is limited, and before we are aware we are tolerating a putrid mass emitting death, unseen and not suspected, in all directions,

the "cone of soakage" from such places can be imagined, but the distance and directions that excretal liquids are carried underground, is unknown.

Much more fatal and dangerous is the practice which abounds so generally of using abandoned wells for cesspools, or deep cesspools dug to the depth of shallow wells. In both cases, the putrid, poison sewage, freighted with innumerable germs of disease, is conveyed by the natural water channels into other wells.

The nature of our subsoil being that of slate rock, we have no filtration, but merely percolation, and the products of decay and putrefaction are carried long distances without oxidation. One abandoned well, charged with sewage, does incalculable damage in a city, and should be declared a dangerous nuisance, and the same speedily abated. Only a few tests are necessary to convince one that the vault or cesspool of your neighbor, at quite a distance away, is contributing disease and death to your well. Taste, odor, and color may be normal, but the unseen germ that is so hostile to human life, is present and doing its deadly work.

Much to our astonishment, when there is such unanimity of opinion in regard to the many dangers of outbreaks of communicable diseases from the existence and maintenance of cesspolls and deep vaults, that they should exist, even along the line of our main sewer.

The fact is too apparent that the yards in the rear of our business places, as well as the residence portion of our city, it being constantly used as a depository for rubbish, and the accumulation of all sorts of vegetable and organic matter from the cellars is often piled on this mass of decomposing material, and there it often lies until our olfactories warn us repeatedly of the danger within.

It ought not to require the repeated efforts of the Health Officer to abate such evils. Our good judgment dictates to us that all household waste and all excrements should be removed as quickly and effectively as possible before decomposition takes place.

A very practical method of disposing of much of the household waste is to dry and burn it in the stove. In larger cities furnaces are used. To accomplish this, receptacles are placed at the back door to receive the waste, and it is then gathered and burned.

The favorable location of Hillsdale as to the water-carriage system of sewerage commends to every thoughtful person the adoption of that system for this city. The surface elevations give the necessary fall which is so important a factor in the success of a sewer. The system adopted, works to perfection, and sewer No. 1, as laid in our main streets, is a credit to good judgment, and a fulfillment of sanitary laws. The chart of the sewer system, as drafted by Engineer Cook, of Toledo, should be followed, and extensions made as fast as possible, so that all could enjoy the advantages of the best means of removing the sources of danger which are so destructive to human life.

SHOULD HILLSDALE HAVE INCREASED SEWERAGE?

BY CHAUNCEY F. COOK, HILLSDALE.

In February, 1886, our city completed its water-works as originally planned, and $55,000.00 was expended to accomplish two objects: That we might have better fire protection, and that our citizens might have an abundant supply of pure water.

[illegible]

... [illegible] in keeping clean the sewer ...

The sewer system as adopted has for its outlet a twelve-inch pipe [illegible] for all future wants. It has frequent automatic flush tanks which keep the sewer as clean as possible, and prevents the formation of sewer gas which is so difficult to provide against in the large brick system.

We believe that our system is as nearly perfect as we can construct. It causes us little trouble and does its work so quietly that we are apt never to give it a thought or appreciate its benefits.

The question naturally arises why has the system not been completed [illegible] extended more than the once. Doubtless the greatest obstacle [illegible] until within the past year has been the law under which it would have had to be done. Our people did not think best to raise by

general tax the entire expense of constructing sewers. It could be done in no other way.

The council, I think, were justified in so paying for the trunk sewer, as it was to be used as an outlet for most of the sewers likely to be laid, and the property mostly benefited was either public or used largely by the public.

Our charter has been amended so that now property in a sewer district may be assessed according to benefits, thus doing away with opposition that might arise from unequal or unjust taxation. The question of more sewers or not is left entirely with the property owners in each sewer district. If those owners of the property in a district wish a sewer, the common council has to construct one. Each district has to consider only for itself its necessities or desires and whether or not it is willing to pay for them.

If in 1887 or 1888 we had had our present law we would undoubtedly have done much more in the way of extension. Now, however, we are free to act. There can be no objection to the provision made for sewers. The injustice, if any, arising from paying for the trunk sewer out of general tax is compensated for by an annual charge to those who use it. The income thus derived well repays the city for the outlay.

In looking over the sewer map, I can see no reason, from a sanitary point, why one portion should be built rather than another. They will all be built, sooner or later. Is it not better to continue the work of construction as fast as practicable?

While we have been getting our charter in satisfactory form, another obstacle has gradually sprung up, and one difficult to overcome.

Many of our citizens having given up hope of public sewers in their locality, have expended an amount equal to what the tax would have been in providing themselves with cesspools or connecting with abandoned wells. Others are constantly resorting to one of these two methods for disposition of sewage. When they have gone to such an outlay, they are very slow to sign petitions to tax themselves for a public sewer which they do not think they need. They may acknowledge that the public sewer would be better for them, but they can get along without it, and they will. One is apt to be slow to go to expense of taking up the sewer pipe that has been laid to the rear of his lot and lay it in the opposite direction, and rearrange the house connections. As a rule every cesspool dug is a vote against a sewer, for the present at least. Troubles will come from them, but the troubles will not all come at once, and when one repairs it will do until he has to repair again.

If the cesspools would only all fill up at once, there would be no trouble in getting petitions signed for sewers.

It has been advocated that our health officer should forbid the use of cesspools and abandoned wells. An order to that end would be very hard to enforce, even if he has authority to issue it. He would not have public sentiment behind him, and it would be slow work to educate the people to the point that they would want to forbid the methods of disposing of sewage that the lack of public sewers made necessary.

Nor can we expect a health officer is going to carry on a contest with his neighbors, issuing orders that they would deem unjust, and placing upon them considerable expense, when he is dependent, to some extent, on these same people for a support in his profession. He can not give orders

with that freedom that he could if he held the same position in a large city with a salary that would make him independent.

There is no doubt in my mind but that to get sewers extended, our citizens must be educated to desire them. We can not rely on issuing orders from health officers which would indirectly force them.

The cost of the sewers ought not to prevent a quite general extension of them.

The contract price for the main sewer from its outlet to Waldron street, a distance of 3,579 feet, was $2,489.00; less than 70 cents per lineal foot. There were some charges for inspection which I have not included, as they were useless, and would not again be incurred. Has our city ever made any improvement where the outlay has brought in better returns? Call to mind the nuisances done away with, among them being the out-door closets on the court house grounds, the ones in rear of Sutton's block, and the long row on the alley between Howell and Murray streets. All of them were a constant annoyance to our health officer, and expense to the property owners. Instead, now, are in-door water-closets, which alone increases the receipts of the water-works sufficient to pay a good interest on the investment.

This sewer having been in operation since 1886, we can judge closely of the practicability of the plan, and the cost of maintaining it.

There has never been a single stoppage or complaint as to its working. The only trouble that has arisen has been in the connections on private grounds, due to faulty construction or improper use, and even such troubles have been of rare occurrence.

With a certain increase in the water rates and a merely nominal, if any, cost to keep in repair, that portion of expense of construction that must be raised by general taxation ought to be gladly incurred, as a good financial investment. The sewer already constructed is the most expensive one per foot, so that we can safely use it as a basis in estimating the cost of additional ones. After deducting the least the council can charge to the general fund, the sewers provided for on the general plan adopted ought not to cost the property-owners to exceed 30 cents per foot front, making the tax on the usual four-rod lot $20.00 or less. This, surely, is a low figure, for the benefits to be derived. When once paid, it is paid for all time. The cost and annoyance of keeping a cesspool or privy clean and in repair is done away with, and there is less liability of injury from foul gases. Our citizens are thoroughly satisfied with the water system, as an investment; add to it the benefits of a good sewer system, and I believe they will, the two working together, be profitable, as well as health-giving.

It may be well to refer briefly to danger to be avoided from sewage arising from the character of the soil underlying your city. I have stated that the necessity of using water from wells that may be contaminated has been done away with; but a large portion of our people still depend on that source of supply. Should we not, then, see that such water is kept as pure as possible? If our soil was sand, gravel or clay it might be possible to keep places for depositing sewage far enough away so as not to be injurious. It would require constant watching and strict regulations to bring about such a result. But nearly every part of our city has at or within a short distance from the surface, shale rock. Into this rock many of the vaults and cesspools are dug. It makes an excellent place to empty liquids that you wish to dispose of, as it allows them to flow away so readily. For this reason it is particularly dangerous as a means of con-

veying sewage. You cannot tell where it goes to, it being possible with a very slight fall to go a long distance. The dip is so various that you can not even determine the direction. I think it would be hard to find a soil more dangerous as a conductor of sewage.

As it is impossible to forbid the citizens using well water, we should use all possible means to keep that water as pure as may be. The only practical way for us to do so, is by providing a complete system of sewerage, which is undoubtedly for our comfort, health and financial interest.

DISCUSSION OF THE SUBJECT.

Dr. Walter H. Sawyer, Hillsdale.—This subject admits of but one answer. The beneficial effect of sewerage has been proved in numerous instances, and among sanitarians there can be no question of the good to be derived from a sewer system. It affords the most effective way, where it can be employed, of safely disposing of the waste products of our living. Of course, there are all grades of necessity for sewerage, and as the danger to our community arises chiefly from atmospheric contamination, having an extended system of water-works, supplying the most of our people at all times with good water, our drainage good, and our population not crowded into a limited area, as in large cities. We have taken pride in the general good health of our city, without being especially responsible for it. We have a good system of water-works, the construction of which was accomplished in spite of the opposition of a determined minority. This, together with one main sewer, is the extent of our efforts at sanitation. As physicians and sanitarians, we understand that the advancement to be made towards a better standard of health must be in prevention rather than cure. A marked decrease in the amount of sickness, and a general lowering of the death rate, always follows the construction of a system of sewerage. In some cases, the death-rate from pulmonary diseases, alone the class of diseases which would seem to be least influenced, has been reduced fifty per cent. Expense is the only objection which can possibly be urged against an extension, and where the health of the city is in question, within reasonable bounds, this should not enter into the problem. The majority of our tax payers are willing to contribute to any necessity, to the maintenance of the public health, when once convinced that it is a necessity. This point is easiest proved to physicians and persons familiar with sanitary matters; but it is far the most difficult to prove to the voting majority in any community. Health or sickness is uncertain, and chances may be taken. Money is certain; that must not be tampered with. Knowing as we do that we are constantly contending with disease in one form or another, and that only by virtue of a strong vital resistance do we meet and overcome it, it certainly behooves us to avail ourselves of all the aids which good sanitary surroundings afford to lessen the attacking force. As has been said, we have underlying this city a shale foundation, and our soil is being constantly soaked with polluted water, for the removal of which no provision is made, further than the one main sewer. Thus, with this condition of things, there must be a retrograde tendency in our health standard. It is to avoid this, and

to still better our condition, that we need an extension of our present sewerage system.

Dr. Baker, Lansing.—I don't know that I have anything very valuable to offer, but I wish to add my voice to the advice already given to extend the sewerage system of Hillsdale. I think it of very great importance. I don't know that I would agree with Mr. Cook that the city has no right to

forbid the use of the water from wells; as cities get old and crowded, well water is almost certain to be contaminated. What Mr. Cook says is impracticable here has actually been done in other cities. I think in Brooklyn, New York, the last well has been ordered filled, and filled; I don't think they permit the use of wells there. In the city of St. Louis, years ago, wells were used for the manufacture of "mineral water," and that I think has been done away with. Certainly it ought to be done away with in any large city. The wells were used for the manufacture of mineral water in St. Louis, for the reason that the Mississippi river water is turbid, and a better appearing class of water could be made from the contaminated water of the wells; but certainly, if the wells are to be used for the water supply in Hillsdale, it is my impression that the sewerage system should be extended.

This forenoon we had under discussion the dangers of the contamination of the general water supply; it is a question of very great importance, of course, and we were considering how important it was to guard the lake from possible contamination from a few sources around the border. Here we are in the city using the water from wells absolutely surrounded by privy vaults and manure piles, and all that sort of thing. It seems to me that it does not require any stretch of the imagination to know what we are getting out of the wells in such a place as this; and right here I want to say that the appearance of the water is not everything, and that an analysis of the water is not altogether satisfactory. We are learning now that the chemical analysis of water may reveal the probabilities of its being contaminated, but that the analysis which the human organism gives to water is more valuable; and that water—even though it is found chemically pure and free from objectionable impurities, may yet contain the specific cause of typhoid fever. I have up there a diagram * showing the results of the extension of sewers. The lower half of the diagram is the part to which I wish to call especial attention; it illustrates the question exactly which we have here. In 1854, Munich had its water-supply from wells, and had the ordinary disposal of excreta which is common in towns, by privies. The death-rate from typhoid fever was 24.2 per ten thousand inhabitants, which is not much greater than in some places in Michigan, sometimes. In 1860, they cemented the vaults. That diagram is accurately drawn to scale, and I have distributed in the audience here copies, and if every one here would read the notes at the top of the page, it would not be necessary for me to call attention to it; but I fear some of you may not like to read the small type, and I wish to call attention to the fact that just when they commenced to cement the vaults there the typhoid fever went down; then they commenced sewerage in 1866, and the typhoid rate fell again. The sewers were continued, and the typhoid rate was still further reduced, and in 1881, the sewers having been continued, and they having secured valuable water supply, brought in from outside the city from springs, the typhoid rate was only one-seventeenth what it was in the beginning. Seventeen times as much mortality from typhoid fever under this first system as there was under the other conditions as at present! In 1884, nearly ten years ago, the typhoid fever had been going down there until it is claimed that in the medical colleges, it is impossible to get a case of typhoid fever to exhibit to the medical students; they are obliged to take for that purpose cases that have come in to Munich from without the city. That illustrates what can be done by

* The diagram "Typhoid Fever and Sewers," is printed on page 66.

carrying on the work which is suggested by the papers that have just been read by the mayor and by Mr. Cook; the proper disposal of excreta, putting in sewers, extension of water supplies, protection of water supplies, pays; it pays in dollars and cents; and as far as cost is concerned, nothing is more expensive than sickness and death. It costs to support sick families; what costs the most, I believe, is ill-health and sickness. Such work pays in dollars and cents, and from the standpoint of the sanitarian, it has to be done; it must be done; it is a good thing to do. I wish to add strongly my advice that the work be continued here in Hillsdale.

President Mosher.—I would like to ask Dr. Baker what he considers the danger from old, disused wells that are not filled. You referred to the order in Brooklyn to fill the wells, and that they were filled. Now, if the people simply discontinued using them, and left them without filling, what is the danger from that? Is there any?

Dr. Baker, Lansing.—I suppose the main purpose of filling the well is to make sure that it is not used. However, I think it is not a sanitary measure to leave collections of water of that sort. I think it is better to have all those places filled up; but the main object of filling wells, I imagine, is to make it absolutely certain that they shall not be further used.

Mr. Goodrich, Hillsdale.—I would like to ask Dr. Baker one question, if in examining a sample of water, after you get through the chemical analysis, and follow it along on the line of bacteriology, if you could arrive at any definite results—after you get your colony grown, if you could arrive at any definite result from a microscopic examination of the colony, without a physiological experiment upon an animal.

Dr. Baker, Lansing.—I am not a bacteriologist. I can say, however, that some colonies are rather characteristic. It is hardly a practical subject now, but it may be later in the season, that the colony of the cholera bacillus is rather characteristic. The other day we had a meeting of the health officers of this State at Ann Arbor, and spent some time in the bacteriological laboratory at the University; and I am speaking literally when I say that there was a pailful of specimens of the bacillus of cholera there, actively reproducing, and we had exhibited to us colonies of the cholera bacillus in active motion; and the cholera bacillus colony is rather characteristic. There is hardly any other colony that looks just like it; there is a sort of "broken glass" appearance to it, and a ragged outline to that colony that is very peculiar; but I think, as a rule, that when examining the waters of this State it is customary, in making the tests, to carry the investigation one step further. At that meeting the other day at Ann Arbor, we had passed around to us on platters, two dead rats—white rats, opened in a way to show the intestines, so that any person who wished might make an examination and see the *post mortem* appearances. Each one of those white rats was killed by the same water; they both exhibited the same phenomena; there was considerable enlargement of the spleen; there was enlargement and inflammation of the liver, and the smaller intestines were dotted all the way down with inflammatory patches. Those white rats were dead within twenty-four hours after the injection into them of water from Ironwood,—water which during my investigations there I was led to believe was causing the typhoid fever. At Ironwood, the patients, some of whom I examined, had the enlarged spleen; they had the enlarged liver; they had deaths by hemorrhage from the intestines. I did not make any *post mortem*

examinations there; but I haven't any doubt whatever, if a *post mortem* had been made, that the same conditions would have been found as were manifested in those two rats, killed by the same water as killed the people in Ironwood. That is my judgment. Of course, this morning, I was speaking of the Smead system of ventilation, and I made some remarks about the cases of typhoid fever among teachers and those attending that school. I thought afterwards that I stopped short of telling the whole, because it was not proved, after all, that typhoid fever came from the bad conditions in the school building; it may or it may not. Those who were at the school may have had the typhoid fever, for the reason that they used the city water; still, they may have used other water; it is a complicated study to find out, sometimes, the origin of typhoid fever. But to come back to the question, I think, as the Mayor has suggested, that the investigation should go a step further, and after finding the micro-organisms that are believed to cause the disease, they should be injected into animals, and see with what result; and if the result indicates a condition similar to that which people have, it adds strength to the conviction that we are on the track of the cause.

Mr. Goodrich, Hillsdale.—Is there any method of staining these cultures so that you could determine, without the physiological test, by staining, so that one culture would be stained, while another would not, and locate it that way?

Dr. Baker.—That is true of the cholera bacillus. It is believed now, so we are told by bacteriologists who are continually investigating this subject, that the culture material in which cholera bacillus has been grown, treated with an acid, will take a pinkish color that is characteristic of this one micro-organism; and that is one of the tests made where one is in a hurry to tell whether a disease is or is not cholera, to take the culture and treat it with a mineral acid, and see if that color is developed; and if it is, the conclusion is arrived at that it is probably cholera. In regard to the taking of stains by different micro-organisms, I am not sufficiently familiar with the details to go into that. Most of the micro-organisms are not as they appear here in this drawing; they are not black; they are nearly colorless, as a rule, and the color is only brought out when they are stained; but the vegetable micro-organisms absorb stains differently from the animal tissues, and that is a method of differentiating between them and animal tissue.

Mr. Goodrich.—Is that one method of proving that they are vegetable and not animal?

Dr. Baker.—Possibly. It shows that their tissues are certainly different from the animal tissue.

The president of the convention then called upon Mayor L. A. Goodrich to make some remarks upon the subject. Mr. Goodrich spoke as follows:

Mr. Goodrich, Mayor of Hillsdale.—I don't know as I could say anything to edify the citizens of Hillsdale on this subject. Of course, this is a very interesting subject; all the topics discussed here, and especially the question of drainage and sewerage, and our water supply, and all the points dealt with here, are of vital importance to our city of Hillsdale; and such questions, I think, cannot be discussed too much; and much good ought to result from these discussions, it seems to me.

In the question of contamination of wells from the leaking sewers, I

would be happy to know if there was any cross cuts whereby we can determine by certain tests either the safety or the danger of our well water. Of course, it is a long, tedious task to go through with a bacteriological examination of the water, or a complete chemical analysis; there are very few tests that will place the sample of water under consideration within the limits of certain safety. A very few chemical tests will show whether sewage is seeping into the well or not; but supposing that by certain tests that we have applied we find that sewage is there, of course the chemical tests do not bring out the bacteriological tests at all; and I was trying to see whether I couldn't gain some information from Dr. Baker in regard to short cuts, as you might call them, on bacteriological examination; and if there could be, that would be a great benefit, and save lots of time. I appreciate the importance of the subject of this paper, and of these discussions, and I am only sorry that I didn't have more time and more powers of investigation to give you a better paper.

Dr. Baker.—Mr. Chairman, Mr. Goodrich's remarks remind me that in the University the other day we heard Prof. Vaughan and Prof. Novy tell us—what Dr. Vaughan has told us before—a short method of finding out whether a given sample of drinking water contains any micro-organisms injurious to health; and their short cut is something like this: They have a series of test tubes partly filled with gelatine or other nutrient solution, with a plug of cotton in the top. They sterilize these by heat, and then inoculate the contents of a series of these tubes, and put them away and keep them at the temperature of the human body. If no micro-organism develops in that culture material at that temperature that settles it; they say that they are unable to find in that water any pathogenic micro-organism. They don't always use gelatine, exclusively; they take different solutions which more nearly represent the constituents of the animal body, and after subjecting the inoculated material to the temperature of the human body for a short time, 24 to 48 hours, I think, if no micro-organism develops at that temperature, they conclude that there are none there of the sort dangerous to man. This is a "short cut." If they find that there are micro-organisms that develop at that temperature, then they use the culture of the micro-organisms and inject it into animals, if the animals that are thus inoculated die, then they know that they have a micro-organism that is capable of causing death. Those are two methods they have there to find out whether a given sample of water does or does not contain disease germs. They take, however, only a small portion of the suspected water to make the test with. At Ironwood a sample of the water was taken at the city hall, about in the center of the city; it was assumed that the water there would be an average sample. It was sent to Prof. Vaughan, and he could find no pathogenic organism in it, and so reported. I went to the water-works, and I found what I considered to be the contaminated water still coming into the reservoir. I sent a sample of that water down there, and he found it full of pathogenic micro-organisms. I found that that water, a sample of which I sent him, was only coming into the reservoir when it was pumped a little lower than common; when the full amount of water was pumped into the reservoir and kept it full, the polluted water on the outside was not coming in. If any one collected a sample of the water at that time, it might be perfectly harmless, for the reason that the pressure of water in the reservoir would naturally keep the contaminated water out; and fifteen minutes later the water might be pumped low the foul water flowing in, it might be deadly; so that in making an examina-

tion of a public water supply, all that can be said is that the conditions are so and so at the time the sample was taken; but an hour later the conditions might have been altogether different. That was the case at Ironwood; the difference of half an hour between taking a sample from the reservoir would make a difference between a deadly water and one that was comparatively harmless.

Mr. Goodrich.—I would gather from these remarks that, in the system of water-works we have here, we have what are called dead ends, where there is not as great a water supply as in other portions; and if a person were to send a sample of the water off for analysis, he would seek samples from these dead ends, that are not flushed as thoroughly, as well as from a place like the city hall.

Dr. Baker.—Yes.

Mr. Goodrich.—Well, these micro-organisms, of course, would follow the same law, I suppose, as all filth, that is, as you might say, that you would find more in such places, that are not in circulation.

Dr. Baker.—As a matter of fact, the first cases which occurred at Ironwood were where there was the most water being used and drawn out; the water that went through at that particular time was contaminated. After a while the cause was so far removed, that it was only intermittent—it was only occasional. Now, the first onset of typhoid fever was in the hotel where perhaps the largest quantity of water was used. It might sometimes occur, as Mr. Goodrich has suggested, that the cause might come from the dead ends; but in that instance the first onset was at the place where the greatest quantity of water was drawn.

Mr. Goodrich.—Mr. President, I hate to ask all the questions, but here is a point in regard to which I would like to ask the doctor. Take it in our system of sewerage, we have a main sewer here that is flushed with flush tanks at regular intervals, so that they are flushed five times in twenty-four hours. Now, then, if there are germs of disease, any of these micro-organisms that are introduced into the water, could there be possible danger arising from our ventilating shafts into the sewer? Under those circumstances, would there be any danger of harmful gases, or germs, coming from the ventilating shafts, or man-holes as we call them?

Dr. Baker.—I suppose that is possible. That is something like what occurred at Jackson, at the State Prison. There they had their hospital on the fourth floor, in the main building. If a person was taken sick with typhoid fever, of course the discharges went into the ordinary soil pipe. There was a break in this soil pipe in a room on the lower floor, in one of the great halls in which the prisoners sleep. At the other end of the building, there was an immense ventilating shaft, I think seventy feet high, with an opening into it at the floor three feet across, which made a tremendous draft at that end of the block, and the break in the sewer was distant the entire length of the great hall. Now, the prisoners who contracted typhoid fever were right along in line with the break in this soil pipe between that and the ventilating shaft. This suggested to us the possible origin of the typhoid. We thought at first the way in which this typhoid was being spread was by the water; but apparently it was not due to the water at the prison. We wanted to test that sewer, to find out if it could come from there. So we had someone make a break into the dead end of the sewer below; took a bottle, sterilized it by filling it with boiling water, had a prisoner put it in there and remove the cork of that bottle, and let the water out and the bottle fill with the

air of that sewer, to see whether, in the flushing of the closet up on the fourth floor, it forced a current of air down there, whether it brought a current of typhoid germs. That bottle was taken to the laboratory at Ann Arbor, and the micro-organisms of typhoid fever were found there. That would seem to answer the question in the affirmative. If the typhoid germs are there, it is possible to have them forced out of the sewer, (if it is not full) by a strong current of air. I must say that we had another little test in the same line while that sample of air was being taken, and the closet up stairs flushed, I was talking with the warden,—and I had an injunction afterwards to keep my mouth shut, because I went home and had a run of typhoid fever, and when I made the investigation I drank no water, I ate nothing at the prison, although I was there for a day or two, making that investigation; I could tell no other way that I got it except as I got the micro-organisms, possibly, from inhaling the germs from the openings in the sewer or soil pipe.

Mr. Goodrich.—I should think you would get the same result from evaporation.

Dr. Baker.—But you don't, because you haven't got that strong current of air. That is the reason that suggested itself to me. The practical fact is that evaporation does not take the germs up. Several experiments have been made in investigating this by Dr. Carmichael. I think, however, those are about the only experiments that have been made; possibly if some one else would repeat those experiments, it might be possible—we don't know everything yet. We rest, however, on the experiments made by Dr. Carmichael, in the conclusion that ordinary evaporation does not carry up the micro-organisms.

Dr. Sawyer.—It seems to me that it is very possible, that these germs would be developed in such a sewer there.

Mr. Goodrich.—Fermentation wouldn't produce these germs, would it, if there was no germ there to start them? The sewer simply forms a congenial place that they develop in?

Dr. Baker.—That is all.

Dr. Sawyer.—What is your idea of the danger in the same room with a typhoid patient?

Dr. Baker.—My idea is that ordinarily the danger is very slight; but now and then, occasionally, typhoid may be so contracted. Dr. Kellogg of Battle Creek, who was a member of our board, two or three years ago, made some very careful provisions for preventing the spread of typhoid fever; he had a number of cases, and there were two or three cases that could hardly be accounted for in any other way than that they were spread from person to person in the same room; that must be very unusual, I think, but it does sometimes occur.

Dr. Moore.—Don't you think that the germs of typhoid fever can be carried in strong currents of air, as well as any other germs, and taken in from the mucous membrane?

Dr. Baker.—Yes, but they would have to be swallowed in order to cause typhoid fever.

Mr. Goodrich.—Is there any danger, except from the typhoid, in the cesspools and sink vaults that we have here, especially where it is not connected with the sewer. Do you think, with the organisms like those which come from the cesspool, it would lower the vitality, or produce other troubles?

Dr. Baker.—Well, I don't know anything about their lowering vitality

I think we have very little evidence of that; but Prof. Vaughan is able to say that there are here a number of micro-organisms which are very similar to the typhoid bacillus. Dr. Vaughan has found, in a large number of instances, these micro-organisms which are capable of causing death in the lower animals, such as rats, and were, apparently, capable of causing sickness in man, and fevers. It is quite likely, it seems to me, that in the future we may have different names for fevers. "Fever," years ago, included continued fever, remittent fever, typhoid fever, and typhus fever. These were all simply fevers then. Now, we are able to sort these out. We know that typhus fever is a little different from typhoid, and the names of fevers, perhaps, will be more numerous in the future than they are now. I think you may put this fact which I have mentioned, of Prof. Vaughan's investigations, with the fact which your physicians here note, that they have cases of fever—I have been to houses where there were two cases—which are not called straight typhoid fever. Very many fevers have not all the typical scientific indications of typhoid, yet they are practically, for public-health purposes, typhoid fever. The State Board of Health, to get around that, has passed a resolution like this, that in every instance of a fever of doubtful origin, if continuing more than seven days, the physician or the householder should report it to the health officer, and precautions should be taken the same as in typhoid fever. That is the practical way to restrict it.

Dr. Sawyer.—What do you report that as?

Dr. Baker.—For public-health purposes, it is typhoid fever; for persons themselves, they can call it what they please.

President Mosher.—I was wondering if in the case of these blind wells, of our cesspools or vaults to receive the waste water, water from the sink, or the dirty water, and all of that, whether anything would be gained for the safety of the family by erecting over the vault out-doors a standing-pipe that should act in the nature of the chimney in a house, so that a draft up through that stand-pipe would carry off anything and distribute it in the upper air, out of the way of the people breathing it, and prevent it from coming back through the drain pipes into the house, so that there would be a guard against anything of the kind.

Dr. Baker.—I don't think there could be much gained in that way; and that is our objection to the Smead system. If the germs are dried, and there is a current that takes them up, these micro-organisms are liable to come down somewhere. It may be on your roof, in your rainwater; it may be somewhere else. The best way is to dispose of them so that they won't be coming back again and be in the way. In other words, the system of disposal of excreta which is the best is the water-carriage system; the extension of the sewers to which the paper to which we have just listened refers. This is a method of disposal which is safe, and the only one that is safe, so far as I know. We come around every time to the fact that if you have sewers, you lessen typhoid.

Mr. Goodrich.—Might that excreta not be dried so rapidly as to avoid this danger?

Dr. Baker.—If it is dried it is not destroyed. The cholera bacillus is; the typhoid bacillus is not destroyed by three weeks drying.

Mr. Goodrich.—Isn't it generally supposed that there is more danger where there are more of these germs?

Dr. Baker.—Yes, sir; that there is more danger by increasing the num-

ber of the micro-organisms, as is done by allowing them to remain in warm places.

President Mosher.—Why isn't there practically the same danger, doctor, from the sewerage system, of the danger of back drafts from the sewers into the houses, that there would be from this case of the vault that I was speaking of?

Dr. Baker.—Well, possibly there is; in the construction of a house drain, the soil pipe goes through to the roof, to be sure, but the theory is that the danger is carried off, the water carries everything with it, and that there is no large amount of dry surface there, under ordinary conditions. It is possible that typhoid might be communicated in that way, but the practical result is that where this system is carried out, not only in one city, but in all cities which have adopted it, typhoid fever is lessened, and typhoid is the disease that we aim to prevent by these processes. By that diagram* you will see that the average mortality from typhoid fever in 313 cities which have not sewers is six or eight times as much as in the cities with sewerage.

Mr. Cook.—In this system we have here, a sewer system with a constant flushing, as stated by Mr. Goodrich, once in five hours, although they don't discharge at the same time, but with this almost constant current of water running through the pipe, are any injurious gasses from the sewer likely to be formed?

Dr. Baker.—It isn't the injurious gas we fear, but micro-organisms. The injurious gas is comparatively slightly injurious.

Dr. Sawyer.—What Mr. Cook means is whether there might be gas with the water conveyance to amount to anything, it is taken so quickly from the house and emptied into the river.

Dr. Baker.—That is the idea we have; that is the safe way, as a rule.

Mr. Goodrich.—Isn't it an advantage that in the water-carriage system safety not only is arrived at by the rapid removal of excreta, but by flushing? one of these flush tanks, you see, is capable of flushing a good deal. Well, as the water runs out, it must necessarily create a vacuum there, and the vacuum, of course, must draw air from the surface to close the vacuum. and the draft would be down rather than up. Wouldn't that be an element of safety in the water-carriage system which we have adopted here?

Dr. Baker.—Yes, sir; and there is an element of safety in the small sewer; we regard the large sewer as dangerous from the fact that it may have this large surface underground, which may occasionally become charged with dangerous micro-organisms; there are surfaces where it is comparatively dry for a long time, and there is an element of danger that is avoided by having the sewers only the size necessary to carry the sewage.

Dr. Sawyer.—Now, there is a question that I would like to ask; perhaps it is not just under this subject. How does the State Board of Health regard membranous croup?

Dr. Baker.—For public-health purposes, membranous croup is diphtheria. The State Board of Health passed a resolution like this, that in all cases of sore throat, the benefit of the doubt should be given to the public, and precautions should be taken the same as in diphtheria. That is in every case of sore throat. Of course, it may be annoying for a person with simple tonsilitis, or something of that kind, to take such precau-

*Page 66.

tions; but on the other hand, lives are lost by not doing that. But membranous croup is diphtheria, for public-health purposes.

Mr. Goodrich.—There is one more question I would like to ask. That is this. We have been talking about micro-organisms, and their development and culture, and all that. We have a system here that is pouring its sewage into a stream, into the running water. Now, then, how long, if we are diluting the excreta, how long will these micro-organisms live in running water? Is there any method of knowing about that?

Dr. Baker.—I am sorry to say that we haven't evidence on that which is very conclusive either way. The running water is full of micro-organisms that are not dangerous to man. They are the ordinary micro-organisms of water; and, as a rule, they are destructive to disease germs; the typhoid germ and the cholera germ stand a poor chance with the ordinary germs that are at home in the water, and, as a rule, would be quickly disposed of. At the same time, sanitarians have said, that when it came to using for drinking purposes, river water that had been polluted that the rule should be, "once polluted, always polluted;" that is to say, that if the sewage goes into the river at Troy, don't take it out for drinking purposes at Albany; don't take it out further down, at Poughkeepsie. Practically, they do take it out at Poughkeepsie, and deal with it in such a manner as to make it comparatively safe. They take it out and run it over falls, and thus air it, and pump it up on a higher level; and their death-rate from typhoid fever in Poughkeepsie is not great. I don't think the same thing can be said of Albany. If I remember rightly, the death-rate from typhoid is excessive there, probably because of the sewage in the water supply. Experiments have been made by the State Board of Health in Illinois to determine the number of micro-organisms found in the river that is contaminated by pumping into it the sewage from Chicago, but these experiments are not yet carried quite far enough. They show a very great destruction or loss in the micro-organisms as you go along down the river, but they ought to be carried out on the line suggested by the Mayor a few minutes ago; they ought to know not only the number of micro-organisms in the given sample of water, but they ought to know what proportion of them are pathogenic, and how long those micro-organisms will exist in the water. The evidence is in favor of emptying the sewage into a running stream, in preference to keeping it hoarded up in a vault, in a well or in a cellar. In Massachusetts the State Board of Health is charged with guarding the purity of the streams, and they are making great investigations there as to that subject; because there the cities must take their water supplies from the rivers. It may be so in this State, after a few years, the State Board of Health may be making a tremendous effort to keep the streams pure, and we may be doing the same way they are doing there now. Their experiments there lead to the conclusion that it is best to so purify the sewage that it may be emptied into streams which are used for drinking water; and the same thing is being done in England, where they have such filtration on a grand scale; but these experiments are not far enough along so that the Michigan State Board of Health is prepared to recommend any other disposal of the sewage.

Dr. Moore.—You wouldn't recommend using bichloride of mercury as a disinfectant?

Dr. Baker.—I would not, no. In the case of known typhoid discharges, the State Board of Health recommends disinfection with chlorinated lime.

Mr. Goodrich.—May I ask the doctor if there is much efficacy in gaseous disinfection, or by wetting a rag and hanging it up in a room?

Dr. Baker.—Those are two questions. As regards the wet rag hung up in a room, I wouldn't think it would count for much; but, on the other hand, if you want to disinfect every crack and cranny of the room, you should employ gaseous disinfection.

Mr. Goodrich.—I beg pardon; the question that I asked was not, as I intended it, gaseous disinfection; but I meant evaporation, mere evaporation.

Dr. Baker.—Well, mere evaporation, I should count that as of no account; but when it comes to gaseous disinfection, that I think is essential. We recommend the fumes of burning sulphur, for the reason that it is more easily handled by the common people, and the average health officer, and the average man, than chlorine gas. Chlorine gas is probably just as efficient, but the State Board of Health recommends three pounds of sulphur to a room of one thousand cubic feet. We absolutely know that that is correct. We have had twenty years experience with this method in Michigan, and we absolutely know that sulphur as a disinfectant, if employed in accordanee with the rules of the State Board of Health, is absolutely effective for the disinfection of rooms of those who have had scarlet fever and diphtheria; and the twenty years experience of the health officer of Boston is in the same direction; and he has even gone so far as to use the clothing of small-pox patients, after he has disinfected it by burning sulphur; used those clothes without any serious results; so that we don't have to experiment.

Mr. Blackman, Hillsdale.—I would like to ask Dr. Gier in regard to one thing. For the last few years, there has been a good deal said about cleaning and straightening the channel of the river here. I have a vague idea why that is advisable, but I would like to have something more definite.

Dr. Gier, Hillsdale.—The idea of that was not so much to prevent typhoid fever as malarial fever. We look upon it differently now than then. Dr. Baker has made suggestions to us here, to Dr. Sawyer and myself and Dr. Moore, that we had not thought of relative to that matter. It is this; that all cases of fever lasting more than seven days, where the origin is doubtful, he would regard, for public-health purposes, as typhoid. Now, we have that stream down through town, and we have the mill pond above, and it is surely a breeding place for what we have known in years past as malarial fever,—the fevers that we have in Hillsdale, and in Hillsdale county, and in Michigan, we have a great variety of fevers outside of typhoid. We call them bilious fevers, intermittent, and remittent. We call them malarial fevers, and we call them continued fevers. It depends upon the doctor and the patient. The point is to get rid of that as a breeding-place for a certain class of fevers. That is the point. It has caused these fevers in the past. We know, of course, that typhoid fever is dependent upon its specific pathogenic germ, but there are fevers of different kinds. We don't know what malarial fever is, whether it has a pathogenic germ; but it is bred and taken care of in just such places.

President Mosher.—I wonder if anybody can tell us—it is a question that suggested itself to me this monrning, I think, when Dr. Moore was speaking, and he suggested that with reference to the high school building, for example, a main sewer be connected with the vaults there, and said that it would be preferable to the Smead system which we have there now. I

wondered what method he would recommend for disposing of the outflow from the pipes that would be any safer for the public health than the Smead system which we already have there, and if that river is turned into a sewage reservoir, why isn't Jonesville, for example, in danger of getting up in arms and coming over here and compelling us to abate a nuisance—why aren't we sending typhoid fever over to Jonesville, with our compliments, instead of keeping it in the high school for our own children, in case of the drain pipes such as Dr. Moore suggests? Is there any way of telling what the relative danger would be to the public health as between the Smead system, which we now have, and which we may regard as dangerous, with the back drafts, and the same danger distributed on the border of the stream, by turning it into a sewage reservoir?

Dr. Baker.—It is not a proper source for a water supply; and so far as we know, there is no other way they can get typhoid fever from that water. The evaporation from the river certainly won't give it. We can rest upon the experience we have had, and on the experiments of Dr. Carmichael, that typhoid germs are not carried by evaporation. Here is an illustration of that; the sewers in Paris; people by the hundreds go in there to see those sewers. It is one of the sights to go on certain days, under a permit from a certain officer. No one was ever known to take the typhoid fever there in that way. It is not from the evaporating of the sewage that Jonesville is in any danger. When they drink water which contains sewage, that is the way typhoid is usually spread. Of course, if they took that sewage and dried it, the way you do by the Smead system, and send the contents up into the air to be inhaled, that would be a different thing; but I understand that the St. Joe river runs right on through Jonesville, and without drying up, except a little along the margins.

Dr. Moore.—Just one question I would like to ask. It is this. I think everybody is impressed with the importance of having a good water supply. Now, we get our water from Baw Beese Lake, and in the discussion this morning, it was suggested, that no bathing ought to be allowed anywhere near the intake pipe, and, of course, no excreta disposed of or dumped into the lake at that point, and I would like to have a recommendation from the State Board of Health to that effect, that there be no bathing allowed at the south end of the lake, and I will see that it is enforced, if you think that we ought to enforce such a recommendation.

Dr. Baker.—Well, the State Board of Health won't be in session for some time, and I don't know whether they would feel like doing that. I think you have had the views of the president and secretary and one of its members this afternoon. I think that is perhaps as near as it would be practicable to get. There certainly ought not to be any bathing in the vicinity of the drinking water, it seems to me, in the course of drinking water, and it seems to me it ought to be forbidden by the proper authorities, and I would like to see done what I suggested this morning, that no such disposal of excreta be permitted to continue as is employed up there now; that you should force a connection with the sewer which should bring the excreta down this side of the water-works into the stream, and I should not fear the sewage in the St. Joe river as it went through here, although I must say that it is not a pleasant view to contemplate that pond back there; I think it would be very much more aesthetic, at least, if that were straightened and drained, and there was a straight channel on down; and there is another good reason why that might improve the public

health. We had here this afternoon a diagram* which showed that during those ten years the sickness from intermittent fever had been reduced about one-half. Now, speakers this afternoon attributed that largely to the influence of germs. I may be mistaken on that, but I believe that a large part of this lessening of intermittent fever has been in the change between the day and night temperature. I think you can make a difference between the day and the night temperature by lowering the water level, and after the lowering of the water level to leave it so that it should be all dried out. I think a great share of the reduction in intermittent fever is due to that change in the climatic conditions that has come about; that is my belief, and I think that the conditions would be greatly improved, and the intermittent fever less, if that swamp were to be drained.

President Mosher.—I wanted to ask Mayor Goodrich a question; whether his observations have led him to believe that wells, for example, may receive their water supply, either wholly or in part, from streams, and from rivers; whether that would be possible or not.

Mr. Goodrich.—Yes, I think that is possible, that is, not only from streams, but from lakes and swamps.

President Mosher.—Well, I think Jonesville people, on the whole, are pretty careful people, and are a pretty neat kind of people; they wouldn't drink the St. Joe river water any more than a good average Hillsdale person would; but their own water, the wells which they resort to for their drinking water, might they not possibly be contaminated from the St. Joe river, from the fact that wells are so supplied from running water, as I think they might be very easily; is the mere exposure of the water in the running stream to the air, every particle of which carries oxygen to it, does it oxidize every particle of excreta which is put in there?

Mr. Goodrich.—As I understand it, the great benefit of the water carriage system is not only that the sewer gets and keeps the excreta and germs in the water, but above all such action of the sunlight and air in the water that it oxidizes quickly, that is, the excreta, and the germs, so that if you analyzed a sample of the river water here at the mouth of the sewer, and at the same time analyzed a sample down in Jonesville, there will be no comparison at all, that is, as far as the sewage is concerned; we will find that it will disappear almost wholly in carrying it that number of miles. As the doctor said you can take sewage, almost, and by oxidation, passing it over falls, so that more air will mix with it, more oxygen will mix with it, it may become fit to drink, so that it will not be injurious at all, and the active organisms in the water will pounce upon these germs that are hostile to life, so that there is one method of purification. There is one safety of the human race, what we know is one of the best means of saving human life, is by means of plenty or air and plenty of oxygen; and in relation with this, I received some samples of water from Coldwater once, a few years ago, at the time they had an outbreak of typhoid fever there, and some of the wells, the surface wells, gave every evidence of being supplied from the lake, probably, or from the river, for the reason that the fresh water plants and animals that you will see in fresh water were found in the deep wells, eighty feet down; you would find the same organisms that you would in a single drop under the microscope from the stagnant pool, the same shape you would find in this deep well, where there was no sign of such a thing; there were no chlorides, but the test for organic matter,

*Page 52.

free ammonia, was high; but not only was there that animal life in one well, but in different ones, samples of deep well water, proving to my mind that the source of that water supply was from some lake or surface pond.

Dr. Johnson, Hillsdale.—Do you remember analyzing some water from a well where I had some patients using from it—three or four cases of malarial fever, that those same animals were found that are found in marsh water, were found in the water from that well?

Mr. Goodrich, Hillsdale.—Yes, those same animals, certainly, fresh-water animals, indicating that the supply comes from some surface water.

Dr. Johnson.—There is another question; the sewage going into the river. I suppose we couldn't prevent, very well, the cows and animals using the water out of the river; it would be hard to do that; but might it not be possible, for the milk of the cows using water from this source to give typhoid fever?

Dr. Baker.—That is a question I am unable to answer. A few years ago, we gave that question to two members of the State Board of Health, with a request to make the necessary experiments,—Prof. Vaughan and Dr. Kellogg. Dr. Kellogg made a few experiments, but was unable to reach any conclusion; his experiments were negative as far as they went. We have no evidence of it at the present time; it may be possible, but it is not proved, so far as I know.

Dr. Gier.—It is possible for consumption to be transmitted in that way, isn't it?

Dr. Baker.—The germ of consumption does not enter the system directly, as a rule. Some consumptive man spits on the hay, in that case the disease is transmitted to the cows, and the milk sometimes contains the bacillus of tuberculosis. That has been demonstrated; but as regards typhoid fever it is not known to be true; but it is possible.

Dr. Sawyer.—There is a question I would like to ask; it isn't just in the line of the discussion this afternoon; it is in regard to tonsilitis. You have a case of tonsilitis in a neighborhood, and the first thing you know all the children in the neighborhood have it; and yet it isn't classed among the contagious diseases.

Dr. Baker.—My own view is that all sore throats are communicable, and that the resolution of the State Board of Health ought to be enforced by health officers. It think that when the State Board of Health has declared that a certain disease is dangerous to the public health, the public and the health officers ought to accept that decision. It seems to me that the people and the local health authorities ought to do what the State Board of Health has recommended, that is, "in every case of sore throat precautions should be taken," and the children should be isolated until it is proved that it is not diphtheria or scarlet fever.

FIFTH SESSION, FRIDAY, JULY 7, AT 8 P. M.

Vocal solo by Miss Snyder.

DISCUSSION OF THE SUBJECT OF SCHOOL SANITATION.

LED BY PROF. W. L. SHUART, SUPERINTENDENT CITY SCHOOLS.

LADIES AND GENTLEMEN:—None regret more than I that Prof. Gurney cannot be here, or that he did not have the time to write a paper to be read here before you tonight. I fear that the few crumbs I may have to offer will be rather tasteless after the many good things to which we have been treated during this convention. But, Mr. Chairman, I doubt whether any other topic brought before this convention deserves a more careful consideration than the subject of the hygiene of the school-room. No higher duty devolves upon us as citizens, parents, physicians, and teachers, than the earnest consideration of this question. A sound mind in a sound body, with its natural sequence, sound morals, should be a product of modern education, and into this problem the hygiene of the school enters as a most important factor.

The subject of ventilation has been pretty well aired. The subject of heating has also been well discussed; and so I have little to say tonight; only to make a few remarks along the line of physical culture in our schools. It has been said, and with what reason you all know, that the country lad, accustomed to labor and athletic sports, may find himself, at the age of twenty, inferior to his city cousin in mental discipline, but his greater physical vigor enables him easily to outstrip the other in the contest of actual life. The boy in the country has perhaps little need of training in physical culture during his school life; but when we come into our village and city schools we find that there is much need of physical training for our boys and girls. It is a good thing that there are revolutions in school life, as well as in governments, else we should have today in our cities boys and girls who would be so weakly that they would not be able to do well the work required of them in school life. A few years ago, text-book instruction ran so high under the government of the city superintendent that teachers had little time for anything else, or thought of but little else, except to get their scholars, the boys and girls, ready for the expected examination; a system of cramming detrimental to the development of the man and the woman to do the work of life in future years. But a change swept over us, and today, our first care is for the health of the boy and the girl, the development of the body, knowing that then the brain will take care of itself. Today the practical and scientific educator is looking for this in his school. The superintendent, ladies and gentlemen, who goes about to see how much can be crammed into the minds of the children and reproduced to make a show for delighted parents and patrons, does not deserve the name of teacher; but it is our duty to look after the real development of physical life that shall enable the boy and the girl to do afterward what they find to do in life; for a busy world will ask, "What can you do, how well can you do it, and how will your strength hold out?" Just here, allow me to say that I am not at all a believer in the sentiment that prevails among so many people, that the work of the school is killing

off many of the girls and boys. I believe that the cause of nervous debility lies outside the domain of the school. Was there ever a time when boys and girls had more vigor than they have today? So far as I have been able to observe, there is no other place as good for the physical health and well-being of the child as the school-room of today. In some form or other, whether it be calisthenics, gymnastics, or the military drill, a system of physical development, properly regulated, should form a part of the school curriculum, and in this should engage for a few moments at frequent intervals both teacher and pupils. There is no reason why our scholars should not go from school at the close of the session with much of the freshness and vivacity of the earlier part of the day. In our schools here, our children sit but a short time. The teacher plans something that will relieve any nervous strain. We have calisthenics; we have marches and drills, light dumb-bell exercises, club-swinging, etc.

I know how easy it is to theorize along the line of hygienic laws, and how difficult it is to grasp and control their application. The desideratum of the careful teacher may not be fully attained, but he can do much, and perhaps the most important of all is, he can inculcate into his teachings the right principles of sanitation and in this way exert a great influence for good. Teachers everywhere are giving time and thought to this most important subject, school sanitation. There is much to be done, for only a beginning has so far been made, but in this work we do not intend to pause until we are enabled to say, "Sanitas, sanitatum, omnes est sanitas." In conclusion, we desire to express our thanks to the members of the State Board of Health, to Dr. Gier, and to others who have taken part, for the benefits we realize we have received from the convention.

Prof. S. J. Gier, Principal Hillsdale High School—In the whole range of sanitary science, and among all the papers and discussions that have been given at this convention, there are none more important than that which applies to the sanitation of the school-room. We are all agreed that the school room is the center towards which the stream of many of the contagious diseases tends, and the source from which they are disseminated; therefore, if this be true, we see that the school-room should be guarded carefully from the entrance into and the passage from it of these dreadful contagious diseases. When we stop to contemplate the length of human life, we find that about one-fourth of the time allotted to man is spent within the walls of the school-room. The child is placed there when abnormal conditions most easily affect the physical organization; the susceptability of the child to contract diseases being inversely proportionate to the age. A strong, vigorous man, may go into an atmosphere poisoned with infectious diseases, and by the very vigor of his body throw off any tendency of the poison to germinate disease. The children's constitution, on the other hand, cannot resist the action of such an atmosphere, therefore the conclusion arrived at is that sanitary reforms should begin in the school-room. You ask, where does the responsibility of this reform rest? First, in a large measure, with the board of education or school officers and tax payers; and, second, there are great and important responsibilities in the hands of our superintendents and teachers.

It remains with the school officers to furnish suitable sites and suitable school buildings, and a healthy surrounding; then it rests with the teacher to study the situation carefully, and use the best possible judgment in utilizing the appliances at hand. We do not want buildings tall and stately, and simply possessing those architectural elements which are

recognized as forming an imposing edifice, but we want buildings formed upon a good common sense foundation, looking more to the results that may be attained in them than to architectural beauty.

The average citizen and taxpayer does not look at the construction of a public building from the standpoint of sanitary science, but he measures its size, regardless of the number that must occupy it; the selection of the site, regardless of the death-dealing germs that infect the surrounding atmosphere; the convenience of equipment, regardless of the comfort, the aches and pains of the child; the practicability of the appliances, regardless of the health of the boy or girl, never stopping to consider that a healthy, vigorous body is absolutely necessary to a strong, active, and fruitful mind, but he measures all these things, I say, by the amount of tax that must of necessity come out of his pocket; and what is the result? We have simply constructed a large establishment where death is manufactured and dealt out to the children in small doses. If the welfare of the children is to be considered, proper volume of air, proper warmth properly applied, and proper ventilation, must be secured at whatever cost. Now, ventilation is never secured except at the expense of heat; then I say, in order to secure warmth and at the same time proper ventilation, we must not regard the item of cost. So much for the duty of the school officer and citizen. No close observer can visit the average school of today without noticing among the pupils many having either little, pinched faces, round shoulders, and hollow chests, or some other physical deficiency; not all, sometimes not any of these are the direct result of confinement in the school-room; but too often they are. Be that as it may, there is no better place than the school-room for counteracting any tendency toward physical imperfections. True, the home should do much of this; but busy, anxious fathers, and tired, overworked mothers, though they would sacrifice much to see their children grow up perfect types of physical manhood, think that if they send their children to school, this instruction in the care and development of the body as well as the mind should be given by the teacher, and justly, too. Too often, the unwise teacher devotes the whole energy of the child to the development of the mind, with the result that the body, robbed of its rightful share of attention, falls behind, literally pining away for want of exercise, and becomes weak and unable to support the brain. He is incapable of sustained effort, so necessary to the best mental progress. He develops into a frail, short-lived, dyspeptic or chronic invalid of some sort or other, unable to cope with the world; his education has prepared him for life with all the essential elements wanting.

This, I say, is largely due to the unwise judgment and ignorance of the teacher. The vitiating effects of school life upon the body do not need to be proved. But if we as teachers adopt the rational course of increasing the physical strength and vitality, by putting into practical use our knowledge of sanitary laws, and instil into their minds the importance of these sanitary conditions, then we will find their endurance greater, and the liability to bad effects from changes of temperature much less. This then, is the remedy. The feeble, flabby muscles must be used. Something more than the sports of the play ground is needed. This suggests the use of light gymnastics in the school-room. There are times when the air becomes oppressive, or close application to a lesson usually difficult causes the flushed cheek, the restless movements of the feet, and the inclination to assume careless and injurious positions, then it is that light

gymnastics should be the order of the hour. Then the eye will brighten, the blood will be sent bounding through the veins on account of the brisk exercise and long-drawn breaths of fresh air, and in a few minutes every trace of languor has disappeared. I wish we might urge upon school committees and officers the propriety and importance of introducing into all our schools, by positive enactment, the careful observance on the part of teachers of a system of school-room gymnastics adapted to the wants of all grades of pupils. Thus, under the wise, careful and judicious directions of the earnest, thoughtful teacher, much may be done to counteract the destructive influences of the school-room.

ACHIEVEMENTS OF SANITATION MEASURED BY VITAL STATISTICS.

BY GEORGE E. WILLITTS, LANSING.

The carnage of a Waterloo or a Gettysburg, where a third of a vast army is destroyed on a single battle field, shocks us, and awakens a spirit of humanity and fraternity which triumphs over prejudice and hatred; and we are constrained to exclaim, "Let us have peace." Peace! philosophers have dreamed of it, poets have sung of it, and philanthropists have worked for it; and the thought is surely growing, that the brotherhood of nations should not engage in deadly combat. Enlightened students of sociology confidently look forward to a time when differences between nations shall be settled by an appeal not to arms, but to international law. They look for a time when the world shall be truly civilized, and the awful carnage of war and its concomitant suffering and sorrow shall cease.

Surely this is "a consummation devoutly to be wished;" but how insignificant is the destruction of life by war, when compared with the destruction of life caused by those great epidemics of disease, such as the Black Death, which have spread uninterruptedly throughout the world, entirely depopulating city after city, and striking down from a fourth to a half of nation after nation.[1] Hecker, in his history of the Epidemics of the Middle Ages, says that the Black Death depopulated not less than 200,000 towns and villages in Europe, in one visitation. In one outbreak in the city of London it destroyed over 100,000 people. In many places in France not more than one in ten was left alive. Only one-fourth of the people of Venice escaped alive and, fleeing, left that proud city a horrible morgue of desolation. Hecker estimated that by this visitation of Black Death, 25,000,000 of the people of Europe were destroyed.[2] In Cairo, Egypt, from ten to fifteen thousand died each day. Of the inhabitants of Caramania and Cæsarea none were left alive. In China alone 13,000,000 people died in this epidemic, and it is said that India was depopulated.

We who have never experienced such an epidemic cannot comprehend it. If such a loathsome plague as the Black Death should break out in this country, and in each of our metropolitan cities from ten to twenty thousand people should die daily, and thousands and thousands of villages and cities should be desolated and whole States should become depopulated,

[1] It is probable that, in wars generally, far more soldiers are killed by disease than by battle, or by the wounds of battle; although soldiers are "picked men," only the healthy, able-bodied being selected for military service.

[2] Some place the number as high as 40,000,000. Hecker evidently considered 25,000,000 a very low estimate. His calculations are based on the supposition that, at this appearance of the Black Death (1348) the entire population of Europe was 105,000,000, or only one-half of what it was at the time he wrote (1832), which is perhaps too low an estimate.

what consternation would seize the public mind! But how much more such a calamity affected the ignorant peoples of the Middle Ages, who had no knowledge of sanitation, and no reliable means for arresting the spread of the disease. So great was the dread of this loathsome and mortal disease, that it overcame the strongest natural ties,—parents deserted their stricken children, and children fled from their afflicted parents, husbands forsook their wives and wives their husbands, at the appearance of the first symptoms of the deadly disease.[3]

But experience is a great teacher, and fortunately for us, we have inherited the benefits of the race experience with these calamities, and many of them, which in former times swept over the world, each like an irresistible demon, utterly baffling all human efforts, we are now able to bring largely or wholly under control. During this epidemic of the Black Death in Europe, it was observed that those persons who kept entirely away from the sick, and from every person or thing that had been near the sick, escaped the disease. Thus arose the idea of isolating the sick from the well, which has developed into such a powerful weapon for combatting the dangerous communicable diseases. It was also during this epidemic that fumigation came into considerable repute as a means for destroying the contagium and thus restricting the spread of the disease, though I am unable to learn that sulphur was generally used. It was also during this fearful ordeal that some people came to see that filth and bad ventilation invited the disease, and that good ventilation and cleanliness helped to prevent the disease. These sanitary measures—isolation, disinfection, and cleanliness—were the most important means by which the Black Death, which ravaged Europe during four centuries, was at last completely subdued.

The Black Death is not the only great scourge which has been driven out of Europe by sanitation. Leprosy, the sweating sickness, and petechial fever have been practically banished by this modern Hercules; and the ravages of many other diseases, such as cholera, small-pox, consumption, diphtheria, typhus, typhoid and scarlet fevers, have been very greatly reduced.

I have frequently searched for a compilation of death rates, from some of the principal diseases, reaching back through a long period of time so as to tell a connected story concerning such diseases; and not having been able to find anything satisfactory, I have undertaken to do something in this direction myself. Part of the result is some diagrams which I shall present this evening.[4] The diagrams relate principally to London, Eng-

[3] "It was an oriental plague, marked by inflammatory boils and tumors of the glands, such as break out in no other febrile disease. On account of these inflammatory boils, and from the black spots indicatory of a putrid decomposition, which appeared upon the skin, it was called in Germany and in the northern kingdoms of Europe, *the Black Death*, and in Italy, *la Mortaleua Grande, the Great Mortality*. * * * The imperial author, Cantacuzenus, whose own son Andronicus, died of this plague in Constantinople, notices great imposthumes of the thighs and arms of those affected, which, when opened, afforded relief by the discharge of an offensive matter. Buboes, which are infallible signs of the oriental plague, are thus plainly indicated, for he makes separate mention of smaller boils on the arms and in the face, as also in other parts of the body, and clearly distinguishes these from the blisters, which are no less produced by plague in all its forms. In many cases, black spots broke out all over the b dy, either single, or united and confluent. * * * The fauces and tongue were black, and as if suffused with blood; no beverage would assuage their burning thirst, so that their sufferings continued without alleviation until terminated by death, which many in their dispair accelerated with their own hands. In the west, the following were the predominating symptoms on the eruption of this disease. An ardent fever, accompanied by an evacuation of blood, proved fatal in the first three days. * * * In Egypt inflammatiom of the lungs was predominant, and destroyed quickly and infallibly, with burning heat and expectoration of blood."—The Epidemics of the Middle Ages. From the German of J. F. C. Hecker, M. D. * * * Translated by B. G. Babington, M. D., F. R. S., etc., London, MDCCCXLIV.

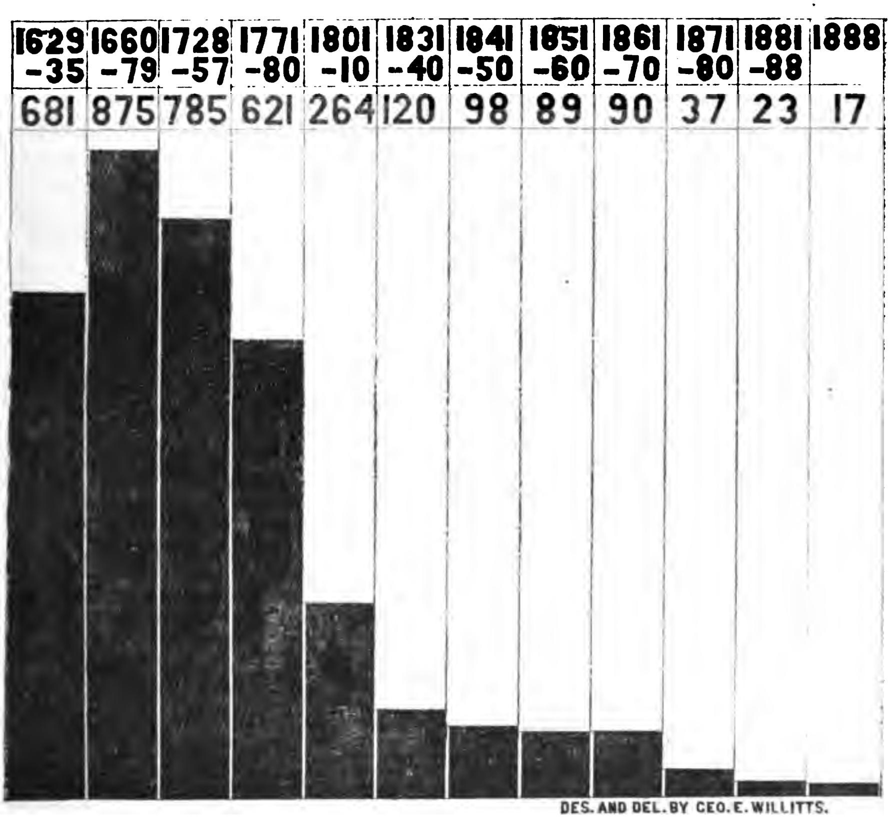
[4] The sources of the data for the diagrams illustrating this paper are given in the foot-notes to the tables (numbered respectively the same as the diagrams) at the close of this article. The headings of the tables are more explicit than those of the diagrams, and the notes to the tables throw some additional light on the diagrams.

land, as that city contains the largest population for which reliable data could be obtained during so great a period of time

Fevers.—This diagram (No. 1.) exhibits the average annual number of deaths from fevers[5] (typhus, typhoid, and simple and ill-defined) per 100,000 population in London, England, in periods representing over two and a half centuries (1629–1888), and shows an immense reduction in the combined death-rate from this class of diseases, it having been over forty times as great in the seventeenth century as at present. Typhus fever, that scourge of the sixteenth and seventeenth centuries, has almost entirely disappeared from London. The specific cause of typhus is undoubtedly a micro-organism, but the conditional causes—those which caused it to spread and become such a formidable disease and such an important cause of deaths in London—were bad ventilation, great over-crowding, and the personal and domestic filth of the people.

NO. 1.

ANNUAL DEATHS IN LONDON BY FEVERS (TYPHUS. ENTERIC. ILL-DEFINED) PER 100000 POPULATION.



[5] These fevers were not differentiated in the early periods, and so are all included throughout all the periods shown in this diagram.

The specific cause of typhoid fever is a micro-organism, called typhoid bacillus (*bacillus typhi abdominalis*)[6], which gains access to the human body most frequently in drinking-water which has become contaminated by the excretions of a previous case of typhoid fever. It is not strange that the people of London had a very high death-rate from typhoid fever when they obtained their water almost wholly from wells, mere holes in the ground, many of which must have received the leachings from carelessly placed cemeteries, and most of which certainly were receptacles for the leachings from surrounding cess-pools and privy vaults which were ever reeking with filthy accumulations.

The causes of death, called "simple and ill-defined fever", were probably largely typhus and typhoid fevers, the symptoms simply not being well marked, so that the unsanitary conditions which I have outlined as the conditional causes of typhus and typhoid fevers, are practically the composite, conditional cause of the deaths represented in this diagram (No. 1.). These unsanitary conditions have been gradually reduced by public-health measures, such as the sanitary inspection of houses and premises, tearing down old pest-breeding rookeries, and building well ventilated model tenement houses for the poor, with more open air-space around them; straightening, widening and paving streets; opening out courts and alleys; introducing good systems of public drainage, sewerage and water supply.[7] These public sanitary measures have had a good educational influence on the people, diffusing among them a better knowledge of sanitation, developing in them more rational habits, and leading them to coöperate with sanitarians for sanitary reform. As these improvements in public and private sanitation have arisen, the combined death-rate from typhus, typhoid, and simple and ill-defined fevers has fallen, so that whereas in the seventeenth century this class of diseases killed, per annum, 824 persons per 100,000 population, it now destroys only about 17 per 100,000 each year. This shows a saving of over 34,000 lives per annum in the city of London from this class of diseases by these sanitary improvements.

Cholera.—Asiatic cholèra is probably one of the severest and most fatal diseases extant. It spreads with astonishing rapidity and nearly half of the cases prove fatal, usually within a few hours. This disease is caused by a microörganism, discovered in 1884 by Dr. Robert Koch, and was named by him the *comma bacillus*, but it is now generally termed the cholera spirillum (*Spirillum cholerae Asiaticae*). Like the *typhoid bacillus*, it gains access to the body most frequently in drinking-water which has become contaminated with the bowel discharges of a previous case.[8] The improvements in the systems of water-supply and sewerage of London, which, as I have shown, have reduced the death-rate from typhoid fever in that city have, also, limited the severity of epidemics of Asiatic cholera.

Diagram No. 2, by means of heavy horizontal lines, exhibits, for London, England, the average annual number of deaths caused by cholera (Asiatic and simple), per 100,000 persons living, in periods representing the seventeenth, eighteenth and nineteenth centuries; and, also, by a heavy broken line, the annual fluctuations in the cholera death-rate during the half century (51 years) 1838–88. It was impracticable to obtain the rates for

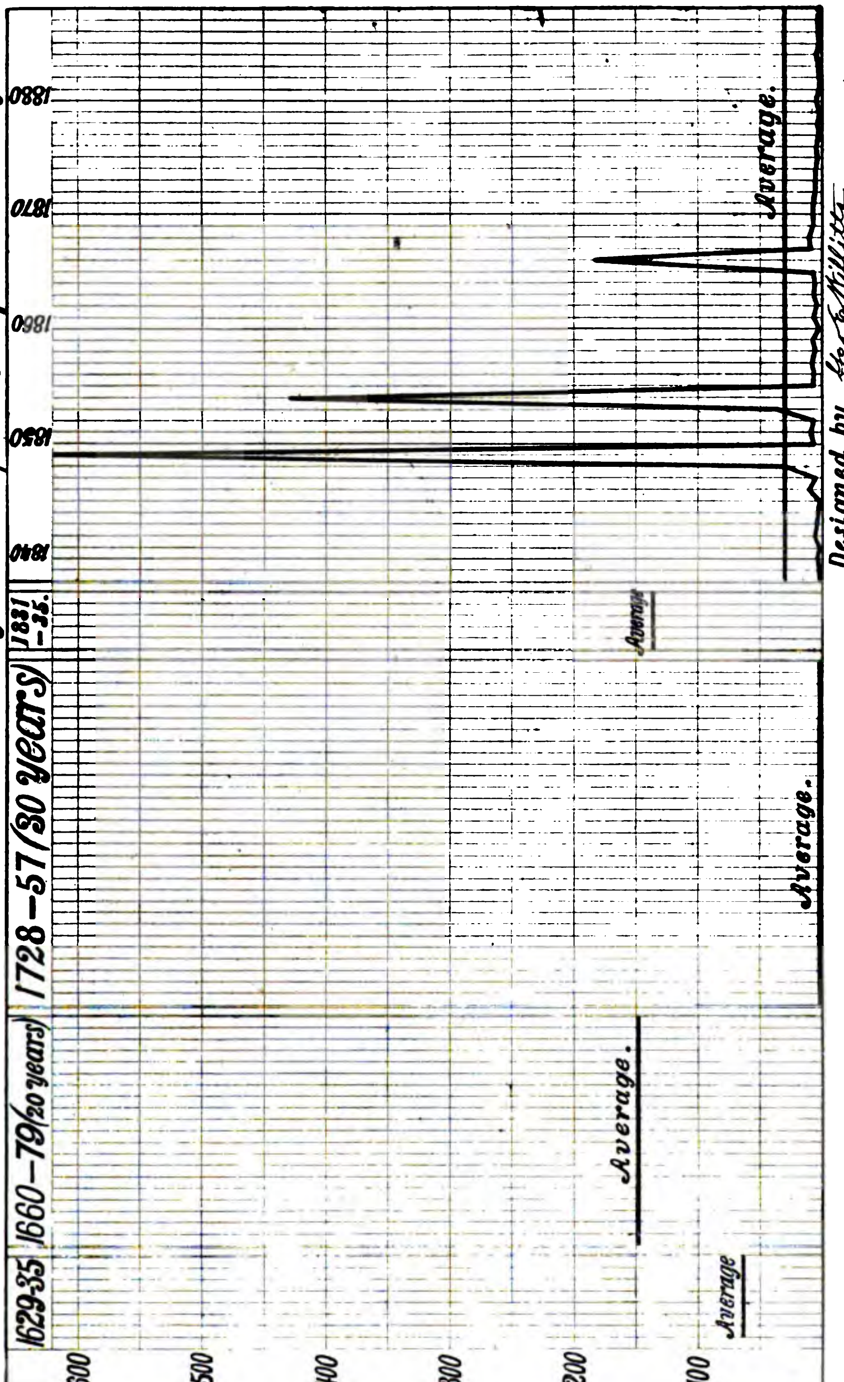
---

6 Discovered by Eberth in 1880. Manual of Bacteriology, George M. Sternberg, M. D., Deputy Surgeon-General U. S. Army, pp. 337–355.

7 The influence of sewerage and water-supply on the death-rate in cities. By Erwin F. Smith.

8 Notes on the Relations of Rainfall and Water-supply to Cholera. By Henry B. Baker, M. D., Secretary Michigan State Board of Health.

No. 2.—Annual Deaths in London by Cholera per 100,000 Persons Living.



separate years in the other periods for which averages are given in the diagram. The data from which the diagram is constructed include both Asiatic and simple cholera (cholera morbus and cholera infantum) as the deaths caused by these distinct diseases unfortunately have not been separately classified in the English reports.

During the period 1838–88 London was free from Asiatic cholera except in the years 1848–9, 1853–4, and 1866, when there were severe epidemics of that disease; and by referring to the diagram it will be seen that in these excepted years the broken line representing the death-rate from cholera shoots upward with startling abruptness to great heights. These great uplifts represent the death-rates caused by Asiatic cholera, while the low, somewhat uniform part of the broken line represents the annual death-rates from the other forms of cholera,—thus contrasting the great destructive power of Asiatic cholera with the comparatively slight destructive power of the other forms of cholera combined. The very high average annual cholera death-rate during the five-year period, 1831–5, was caused by a severe epidemic of Asiatic cholera in London in the year 1832. It is claimed that the first appearance of Asiatic cholera in England was the epidemic of 1831–2;[9] and it is certain that Asiatic cholera could not have prevailed to any considerable extent during any part of the 30 years 1728–57, as the average number of deaths from all forms of cholera was only one per 100,000 persons living. But it seems equally certain that Asiatic cholera must have raged some of the time during the 20 years 1660–79, because during that period the average cholera death-rate was five times as great as for the 51 years 1838–88, during which time we know Asiatic cholera was three times epidemic in London and raised the cholera death-rate during that whole period to about five times what it would have been without those epidemics. It is also probable that Asiatic cholera was present sometime during the first period represented in the diagram (1629–35) as the average cholera death-rate was more than twice as great as during the period 1838–88, in which, as we have seen, there were three severe epidemics of Asiatic cholera. This is more apparent when it is considered that the general progress of sanitation does not as yet seem to have reduced the death-rate from simple cholera, as may be seen by comparing the average death-rate from cholera during the 30 years 1728–57 with the low, somewhat uniform part of the broken line representing the annual death-rate from simple cholera during the period 1838–88. Simple cholera cannot be presumed to have caused anything like the great average death-rate attributed to *cholera* in the seventeenth century. It must have been due to epidemic (Asiatic) cholera.

Dr. Macnamara seems to be confirmed in his belief that Asiatic cholera did not reach Europe before 1831, by the extreme difficulties in the way of European communication with India, which includes the endemic area of Asiatic cholera; but he admits that there were communications between those countries consisting of great caravan routes, such as that over which Marco Polo traveled, which has been in use for thousands of years,

[9] Dr. Macnamara says: "Prof. Hirsch contends that Asiatic cholera spread over India, Persia and as far as Constantinople in the year 1013. I cannot, however, think that he is correct in this opinion; at any rate, the nearest approach we have to a description of Asiatic cholera in Europe before the year 1832 is that given by Sydenham as occurring from 1679 to 1682 in London. He calls the disease cholera; but a contemporary physician of great celebrity, Dr. Wells, writing of this disorder, mentions it as being an aggravated form of dysentery, which, he remarks, reigned cruelly in London."—*History of Asiatic Cholera. By C. Macnamara, F. C. U., Surgeon to the Westminster Hospital, Chap. II., pp. 29–31.* Dr. Hart says: "In England, cholera first appeared October, 1831."—*How Cholera Can Be Stamped Out. By Ernest Hart, Editor of the British Medical Journal, and Chairman of the National Health Society of England. North American Review, August, 1893, p. 187.*

and over which single merchant caravans of as many as 10,000 camels have been known to travel. It is, of course, evident that under the former slow means of travel between England and India, London could not have been so directly, quickly, and frequently infected by cholera from India as at present; but this does not make it improbable that cholera starting in India, did, by a slower process, gradually propagate itself through the intervening populations to England; and the statistical evidence presented in diagram No. 2, as I have demonstrated, most strongly indicates that Asiatic cholera was present in London in the seventeenth century. Dr. Macnamara thinks that the disease in London in the seventeenth century, called cholera by Sydenham, must have been a severe form of "remittent fever." But Sydenham was not the only contemporaneous writer who described cholera in that period, as will be seen by the following quotation from Dr. John C. Peters' able "History of the Travels of Asiatic Cholera in Asia and Europe:—"[10]

"*Cholera in Europe in the Seventeenth Century.*[10]

"In 1610, yellow cholera and bilious fluxes were common in England. In 1617, 1623 and 1626, white fluxes possibly of a choleraic character, were again noticed in England, Germany and France.

"In 1643 Van Der Heyden, of Belgium, described the furious onset of *trousse-galant*, which so altered the appearance of the patients in a few hours that their best friends might not recognize them.

"In 1649 Riverius gives full account of sporadic cholera of considerable intensity, sometimes followed by secondary fever, expulsion of enormous quantities of fluid by vomiting and purging, and sudden death; unless the attack was produced by something which was eaten, when recovery was probable. But the more severe the convulsions and coldness of the extremities, the more fatal the attack. Riverius believed in the existence of contagious and pestilent epidemics of diarrhœa and cholera, as did Piso in 1638.

"In 1665 cholera of some kind was epidemic in Ghent, Belgium.

"We now come to the English epidemics described by Short, Sydenham, Willis and Morton. According to Short, owing to the great heat in 1669, came cholera morbus, which reigned till 1672.

"In 1676 the convulsions were more violent and continued than Sydenham had ever seen there before. He regarded the autumn cholera as very different from the ordinary cholera induced by indigestible food. Willis has not omitted the leading symptoms of white or watery evacuations. He says the disease invaded suddenly, and frequently without any manifest occasion, and did reduce those laboring with it by great vomiting and frequent and watery stools quickly to a very great debility, with a weak, small pulse, cold sweats, and short and quick breath. Very few had bloody stools, and not many bilious; but very many had vomits, and plentiful watery, almost clear stools. It raged in London; but did not extend three miles beyond the city, nor seem to be propagated by contagion. The main cause of the disease he thought to be an evil influence of the air (or water), which was increased by errors of living; but he could not connect the disease with overeating of fruit.

"The celebrated Morton speaks of great epidemic diarrhœas, accompanied by awful twitching cramps, as prevailing annually from 1666 to 1672 in London to such an extent as to *occasion a weekly mortality of from three to five hundred*. The discharges consisted of a copious purging of colliquative white, but apparently virulent, serum. In the year immediately preceding the great fire in London, and when the sanitary condition of the city was horrible, this "plague in the guts" caused thousands of deaths.

"Ettmüller, in 1685, regarded cholera as only an expanded and unusually malignant form of diarrhœa. He believed it to arise from a ferment, either inspired with the air or taken in with the food, (or drink,) or arising from the excreta of the sick, and which multiplied itself after being introduced into the body. It became more or less epidemic, and was at such periods apparently contagious. He repeats, that the disease was caused by the air, by bad water, and by bad fruit. The contagion of epidemic diarrhœa, but especially of dysentery, he supposed to be propagated by latrines, and sometimes even by injection-syringes. Riverius had previously pointed out that in contagious dysentery all (or many) members of a family got it from the use of common latrines or privies.

[10] Published by the United States government in "Cholera Epidemic of 1873 in the United States."

"Pechlin, about this time, describes a cholera which he calls serosa, or without bile.

"In 1689 there was cholera and dysentery in Europe, in Nuremberg; in 1691 in London; in 1695 in Ulm; in 1696 in Switzerland.

"Hoffman, about this time, compared cholera to the effects of arsenic."

The above description, by Morton, of a choleraic disease which caused a weekly mortality of from three to five hundred, can refer to nothing less than Asiatic cholera; for at that time London had only about 130,000 population, and at that rate with the present large population the deaths in London from cholera would be from 1,300 to 2,200 daily.

The above quoted descriptions of choleraic disease by contemporaneous writers, and the statistics of cholera exhibited in Diagram No. 2, leave no room for doubt that Asiatic cholera raged in London during a considerable part of the seventeenth century, and that then, having "run its course" or destroyed the more susceptible persons, it disappeared, and, as at that time there was little communication between England and India, London remained free from Asiatic cholera during the 30 years, 1728–57, the death-rate from all forms of cholera having been only 1 per 100,000 persons living. But toward the close of the eighteenth century England, through the East India Company under the successive governorships of Lord Clive, Warren Hastings and Lord Cornwallis, established its empire in India and took possession of Bengal,--thus bringing London into closer commercial relations and more direct and regular communication with that portion of India which for many centuries has been the endemic area of Asiatic cholera. This and the improvements in means for rapid travel, no doubt, account for the numerous severe epidemics of Asiatic cholera in London during the present century.

At this time when cholera is so widespread throughout Asia and Europe, the evidence presented in Diagram No. 2 is certainly good cause for congratulation, as it may be seen that in former periods when Asiatic cholera was present in London the average annual death-rates for the different periods ranged from 63 to 148 per 100,000 persons living, while in the last period, 1838–88, it was only about 30; and of the three epidemics of Asiatic cholera in London, concerning which we have definite data, there is manifest a remarkable decline in severity, the death-rate in the first having been 620, in the second 429, and in the third only 184 per 100,000 persons living,—showing, even to the casual observer, that the sanitarian's study of the natural history of Asiatic cholera is proving effective, and that he is gradually but surely bringing this terrible disease under control.

The sanitarian has learned that the cause of cholera is the cholera spirillum, which is found in vast numbers in the bowel discharges of the cholera patient, and that the disease is spread by this spirillum gaining entrance to the alimentary canals of other persons, usually in contaminated water or food taken by them. And he has thus learned that the sure way to prevent the disease from spreading is to immediately place the patient within a *strictly sanitary area*,—isolate the patient, and disinfect the discharges so that they cannot, by contaminating the water or food or in any other way, infect other persons.

Last autumn cases of Asiatic cholera were scattered in numerous places throughout England[11] and in the densly populated city of New York; but the disease did not, as in former times, spread and become epidemic,—these outbreaks were, in every instance, stamped out at the very start. *This is sanitation triumphant!* When once more Asiatic cholera retires

[11] How Cholera Reaches this Country. Sanitary Journal (Glasgow) Sept. 20, 1892, p. 320.

to its small endemic area in Bengal, let the enlightened nations unite in vigorously applying these same effective measures there, and utterly eradicate this scourge before it again starts on its periodical march of conquest. It would be far better and cheaper to thus wage an aggressive warfare of extermination on cholera in that comparatively small territory than to be compelled, ever and anon, to wage defensive war against it after it has become widespread over the world.

Consumption.—We have become so accustomed to the presence of consumption that we look upon it as a matter of course, and with about the same equanimity that we observe the recurrence of the seasons; but consumption is nevertheless the most dreadful communicable disease, and has justly been termed the "great white plague." As far back as records of deaths in London are preserved, consumption has led every other cause of deaths. For short seasons cholera or black death claimed more victims, but for any period of ten or twenty years consumption caused far more deaths; and despite the great reduction which has been made in the death-rate from consumption, it still leads every other cause of deaths.

This diagram (No. 3.) exhibiting the average annual number of deaths from consumption per 100,000 population in the city of London in periods representing the seventeenth, eighteenth and nineteenth centuries, shows a very great reduction in the death-rate from this disease, it having been over six times as great in the seventeenth century as it is at the present time.

The specific cause of consumption (*tuberculosis*) is a micro-organism, called the *bacillus tuberculosis*.[12] It most frequently gains access to the body in the air breathed, the air having become contaminated with dry, pulverized sputum from a consumptive patient, the bacilli being found in large numbers in such dust.[13] Consumption has been produced in several kinds of the lower animals, such as dogs and guinea-pigs, by causing them to breathe air containing the pulverized sputa of consumptives. Dr. Gautier, a French physician, accidentally breathed this sputum dust, while experimenting, and thus contracted consumption. When Tappeiner was experimenting on dogs, by placing them in a room where the air was charged with the pulverized sputa of consumptives, a robust servant, of about forty years, more ignorant than brave, did not believe the disease could be contracted in that way, and, disregarding all warnings, went into the inhaling room. Fourteen weeks after this exposure he died of consumption.

When we consider that in the seventeenth century most of the houses of London had no floors but the ground, that over this rushes were thrown, and when one layer became saturated with filth, another layer of rushes was strewn over it, that these hovels were not ventilated, that cuspidors were not in general use, and that the people were in every way extremely filthy,[14] it will be readily seen that in most of the houses this thick carpet of rushes must have been full of the germs of consumption, and the air of the rooms must have been loaded with the tubercle bacilli. It is therefore not surprising that in the seventeenth century there was a death-rate, from consumption, of over 1,200 per 100,000 population.

[12] Discovered by Koch, the discovery having been first announced March 24, 1882. Sternberg, *op. cit.*, pp. 343–392.

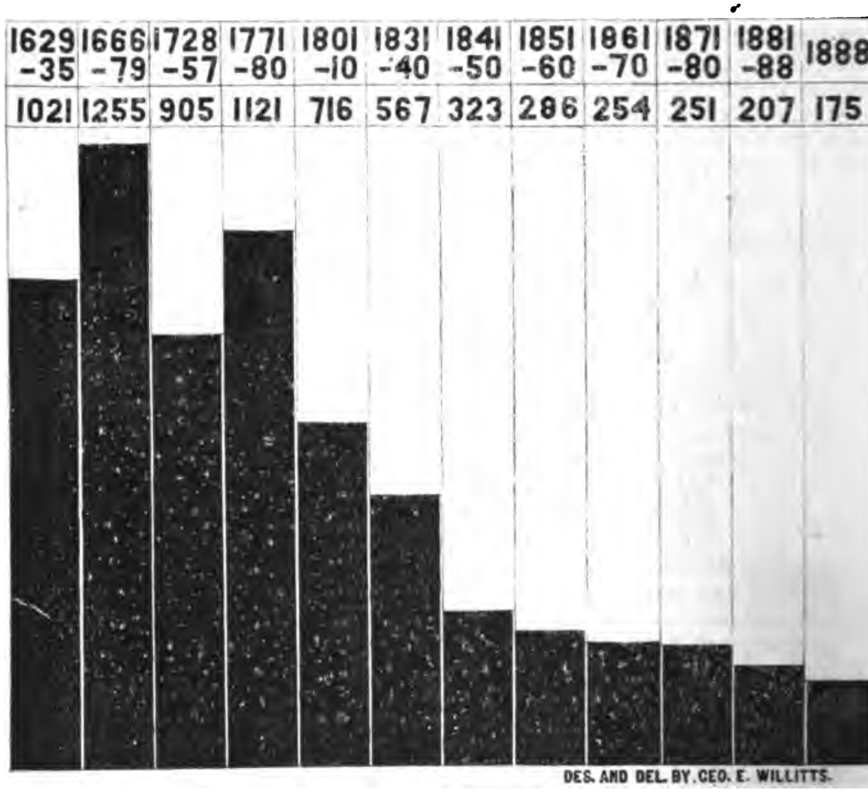
[13] Certain forms of consumption, such as tabes mesenterica and tubercular meningitis, are caused by eating tuberculous meat or milk; but consumption of the lungs (phthisis pulmonalis), by far the most common form, is generally caused by breathing air which has become contaminated by the dust of the dried sputa of consumptives.

[14] Smith *op. cit.*, pp. 84–5. Macaulay, History of England, Vol. 1, chap. III. Hecker, *op. cit.*, Sweating Sickness, chap. III, sec 4.

It will not be difficult to see how the sanitary improvements in London, which I have mentioned as having reduced the death-rate from fevers, have also greatly reduced the death-rate from consumption. The great improvements of the houses, the more general introduction of cuspidors, and the general introduction of systems of sewerage and water supply have

NO. 3.

ANNUAL DEATHS IN LONDON BY CONSUMPTION PER 100,000 POPULATION.



tended to carry the tubercle bacilli of consumptives entirely away from the people. These and supplementary sanitary improvements, including land drainage, etc., have reduced the death-rate by consumption from over 1,200 in the seventeenth century to only 175 at present, per 100,000 population, —indicating a saving by these improvements of about 44,000 (43,944) lives per annum from consumption in the city of London.[15]

Small-pox.—In the seventeenth century, small-pox was not only one of the most loathsome, but also one of the most prevalent and fatal diseases

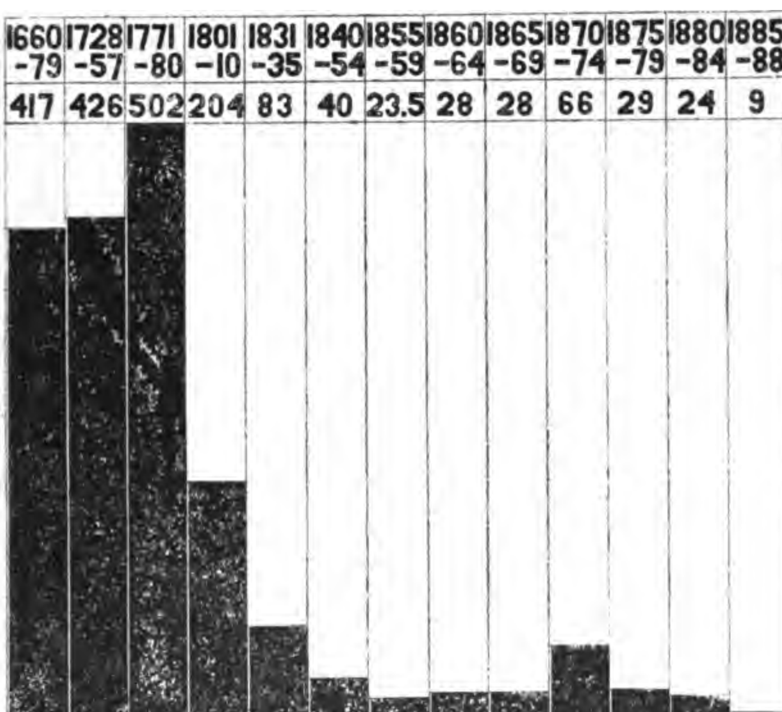
[15] Since this paper was read, the Michigan State Board of Health has taken an important step forward by placing this disease in the list of "diseases dangerous to the public health," required by law to be reported to the health officer by the attending physician and house-holder. The object is to place in his and his associates hands copies of a pamphlet on the restriction and prevention of consumption.

in Europe. It came not as an occasional and transitory visitor, like cholera, but, like consumption, it came to stay, and, like the fabled insatiable Minotaur, grimly exacted its great annual quota of victims, until overcome by the brilliant discovery of Jenner. Macaulay thus vividly portrays the havoc of small-pox in England in the seventeenth century:

"That disease over which science has since achieved a succession of glorious and beneficent victories, was then the most terrible of all the ministers of death. The havoc of the plague had been far more rapid; but the plague had visited our shores only once or twice within living memory; small-pox was always present, filling the church yards with corpses, tormenting with constant fear all whom it had not yet stricken, leaving on those whose lives it spared the hideous traces of its power, turning the babe into a changling at which the mother shuddered, and making the eyes and cheeks of the betrothed maiden, objects of horror to her lover. During the century previous to the discovery of vaccination, small-pox is calculated to have destroyed 45,000,000 of the people of Europe."[16]

NO. 4.

ANNUAL DEATHS IN LONDON BY SMALL-POX PER 100,000 POPULATION.



DES. AND DEL. BY GEO. E. WILLITTS.

[16] The Health Service of a State, by Geo. E. Ranney, M. D., p. 170.

In all the victories of man over nature there is none more brilliant and decisive than the prevention of small-pox by vaccination. It stands out boldly as one of the greatest practical achievements of science.

This diagram (No. 4) exhibits the average annual number of deaths from small-pox, per 100,000 population in the city of London, in periods representing the seventeenth, eighteenth and nineteenth centuries, from 1660 to 1888, the periods from 1660 to 1780 being before the introduction of vaccination, and those from 1801 to 1888 being after the introduction of vaccination.

Jenner announced his discovery of vaccination as a protection against small-pox to a friend in the year 1780, but he first published his discovery in the year 1789. In the year 1790 upwards of seventy of the leading physicians and surgeons of London proclaimed their entire confidence in vaccination as a protection against small-pox. Its success was so apparent that in 1802 parliament granted Jenner £10,000, and in 1807 it granted him £20,000 more for his services in this discovery.[17]

During the ten years 1771–80, just preceding the introduction of vaccination in London, the deaths, per annum, from small-pox were 502 per 100,000 population, while during the period 1801–10, after the somewhat general introduction of vaccination, the deaths had fallen to 204, or only about two-fifths of what they were during 1771–80; and, as the practice of vaccination became more general, the death-rate from small-pox became more and more reduced, until during the fifteen years 1840–54 the deaths were only 40 per annum per 100,000 population. But there were some people who did not avail themselves of vaccination, allowing their children to go unprotected, and in the year 1853, a compulsory vaccination act was passed, by which the parents of children who were not already protected by vaccination or by having had small-pox, or who were affected with other diseases which would make the operation dangerous, were compelled, by law, to have their children vaccinated; and during the five-year period, 1855–59, the death-rate from small-pox dropped to 23.5 per 100,000 population. In the ten years, 1860–69 it rose to 28, and during the five years, 1870–74, it rose to 66, when it was discovered that the protection in those persons who had been vaccinated a long time before, was lapsing, and a system of re-vaccination was instituted, since which time the death-rate from small-pox has declined, until in the four years, 1885–88, the deaths were only nine per annum, per 100,000 population. When we consider that in the seventeenth and eighteenth centuries the average death-rate was 436 per 100,000 population, the present reduced death-rate of only 9 per 100,000 population, shows a saving in London of over 18,000 lives per annum from small-pox.

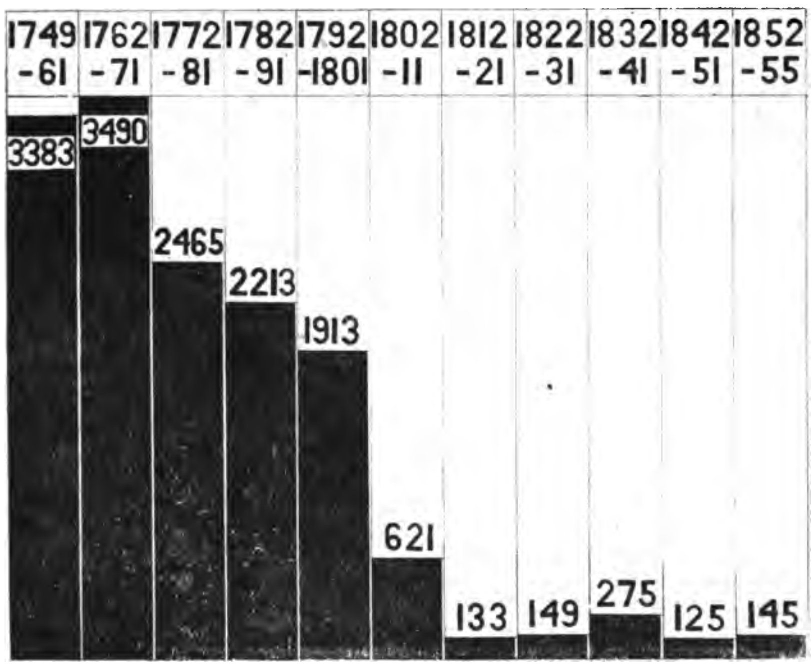
---

[17] At first Jenner met with great opposition; most people were then "anti-vaccinationists," the learned and the ignorant being equally against vaccination. Learned books and pamphlets were written against it, and the clergy denounced it as an impious and profane attempt to set aside the will of God. It is amusing to note the fears excited in the imaginations of some by the proposition to inoculate people with lymph obtained from a disease in *cattle*. The "bestial humor" thus inoculated into the blood of a human being, it was urged, might produce new and dreadful diseases, or might change man's nature to that of a brute, and it was rumored that persons who had been "*cow-poxed*" were actually growing horns, and were going on all fours about the fields, bellowing and bunting like cattle. Rumor even went so far as to give the names and places of persons so afflicted. It is remarkable that, in spite of such opposition on all sides, Jenner's great discovery so signally triumphed within his own lifetime.

The next diagram (No. 5.) represents, for the kingdom of Sweden, the average annual number of deaths caused by small-pox,[18] per 1,000,000 persons living, in eleven periods, during the 107 years, 1749 to 1885.

NO. 5.

ANNUAL DEATHS IN SWEDEN BY SMALL-POX PER 1,000,000 POPULATION.

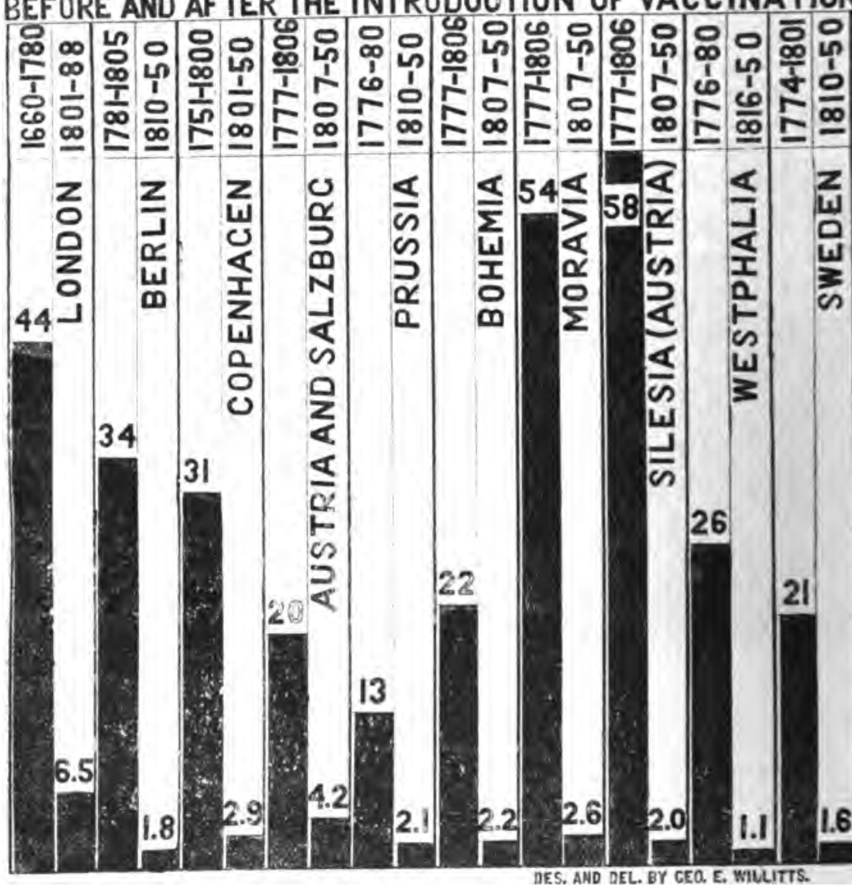


DES. AND DEL. BY GEO. E. WILLITTS.

[18] In the Swedish returns from 1749 to 1778 the mortality from measles was included in the death-rate from small-pox. This, no doubt, accounts for part of the high rate from 1749 to 1771.

Diagram No. 6 represents the approximate average annual number of deaths caused by small-pox, per 10,000 persons living, in various countries and cities during periods before and since the introduction of vaccination. The evidence in these three diagrams (Nos. 4, 5 and 6) should satisfy any person that vaccination is an effectual protection against small-pox.

NO. 6.
ANNUAL DEATHS BY SMALL-POX PER 10000 POPULATION
BEFORE AND AFTER THE INTRODUCTION OF VACCINATION



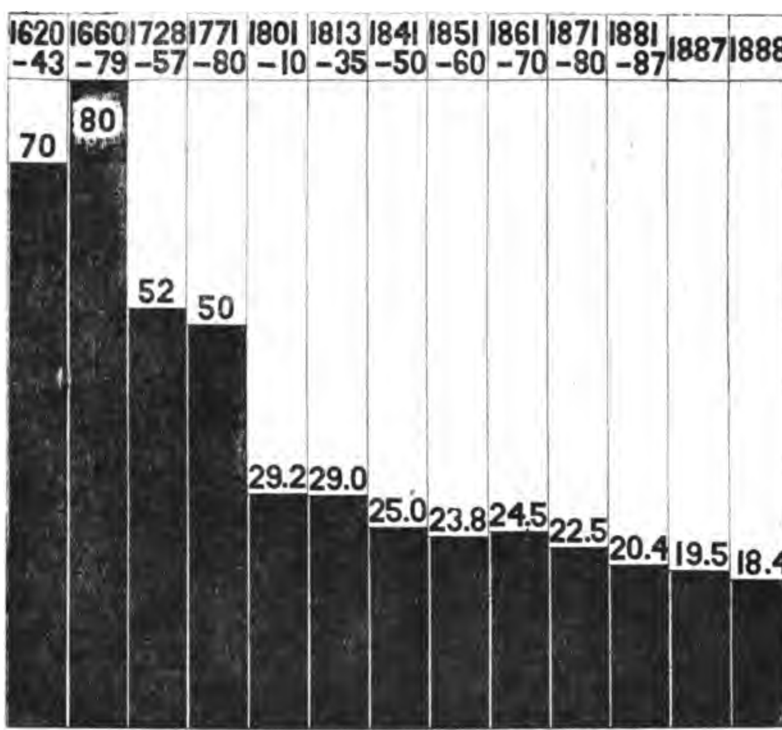
Death-Rate From All Causes.—Thus far I have shown how some diseases which have been the most important causes of deaths have been greatly reduced. But are these genuine achievements? It has been urged by M. Carnot and others that they are only apparent achievements. M. Carnot says, that these lives have been saved from small-pox, only to be killed by some other communicable disease. There is some evidence pointing this way; for the death-rates from bronchitis, measles, whooping-cough, and some of the diseases of summer have been increasing in London. According to M. Carnot the deaths are simply transferred from one disease to

another by sanitation—if the fell destroyer is prevented from capturing his victims by one disease, he will capture them by another disease, and the death-rate from all causes will not be decreased.

Here I present a diagram (No. 7.) expressing the death-rate from all causes, per 1,000 population per annum, in London, during twelve periods, representing nearly three centuries, 1620–1888. With the exception of the single period, 1861–70, when, as I have stated, the protective power of vaccination lapsed in persons of middle and advanced ages who had not been vaccinated since their infancy, this diagram shows an uninterrupted

NO. 7.

DEATHS IN LONDON FROM ALL CAUSES PER 1000 POPULATION PER ANNUM IN PERIODS REPRESENTING THE 17th 18th AND 19th CENTURIES.



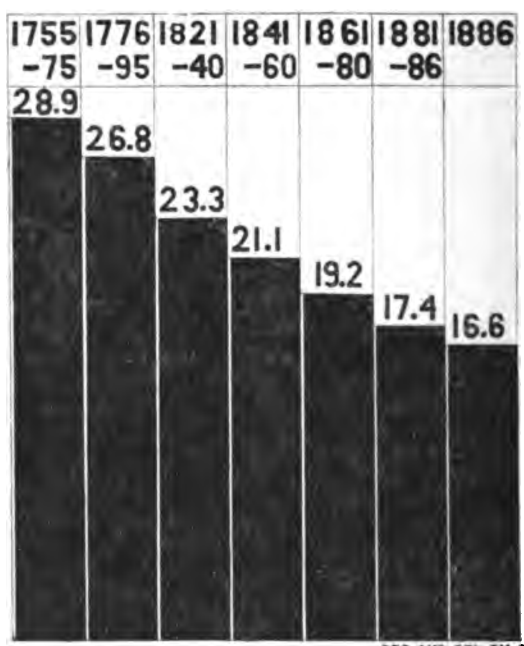
DES. AND DEL. BY GEO. E. WILLITTS.

decline of the total death-rate (from all causes) since the year 1679.[19] These facts break down M. Carnot's theory.

I also present a diagram (No. 8) representing, for the kingdom of Sweden, the average annual number of deaths by all causes, per 1,000 living population, in seven periods representing the eighteenth and nineteenth centuries. This diagram also shows a continuous decline of the total death-rate during many years.

NO. 8.

ANNUAL DEATHS IN SWEDEN BY ALL CAUSES PER 1000 POPULATION.



DES. AND DEL. BY GEO. E. WILLITTS.

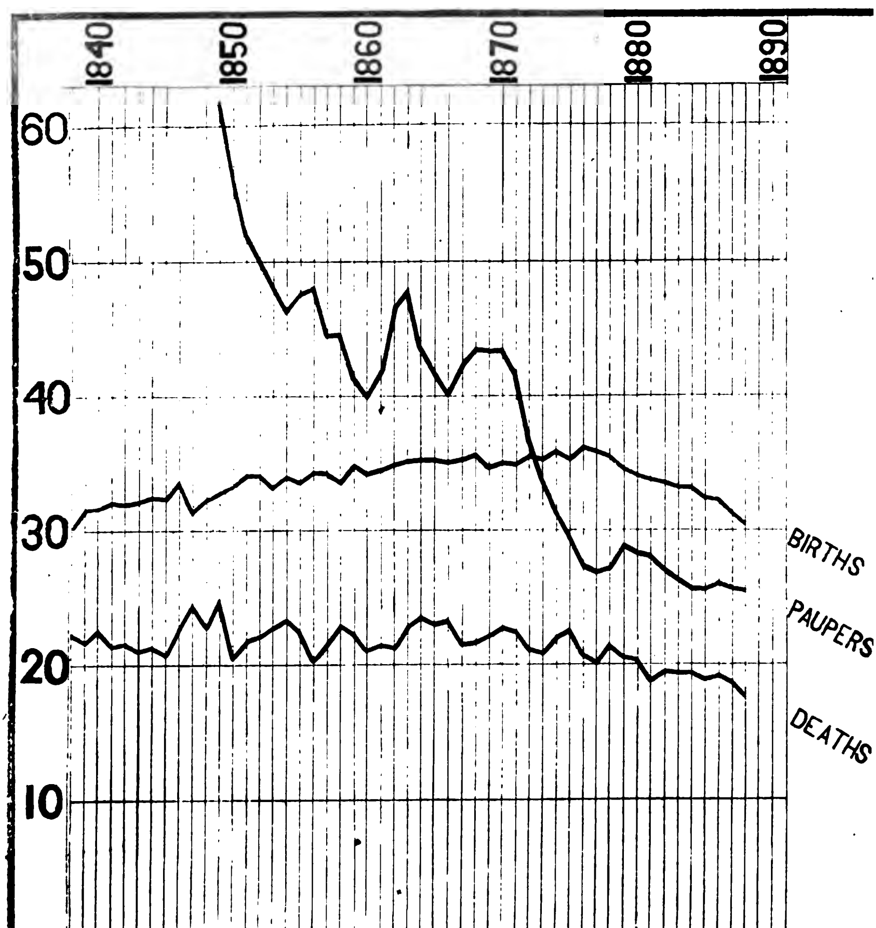
[19] It has been stated that the death-rate of a people cannot be relied upon for any considerable length of time as an unfailing test and measure of their sanitary conditions: because although the lives of those of earlier ages may be largely saved by good sanitary conditions, ultimately they must grow old and begin to die rapidly of old age, thus causing a rapid rise in the death-rate, and thereafter maintaining a high death-rate. Such a rise as is here suggested might happen, but only temporarily, if all persons in a population were of the same age or nearly so; but in the nature of population this cannot happen, as the children are not so old as their parents; therefore, if dying at the same age, their deaths occur later. If a people accustomed to live to be only 20 years of age on the average, were, by improved sanitary conditions, made to live to be 80 years of age on the average at death, the death-rate throughout the whole population would be only one-fourth what it was when the people on the average lived to be only 20 years of age. By whatever proportion the average age of a people at death is increased, by exactly that proportion will the death-rate of that people be diminished, and no extension of time can change this law. The death-rate therefore may be relied upon as an accurate measure of the sanitary conditions (natural and artificial) of a people, throughout any length of time, however great. This, of course, does not refer to selected populations, but to general populations not materially affected by immigration or emigration.

The decrease of the death-rates in diagram No. 7 suggests a curve which is constantly approaching the base line, but at a constantly decreasing rate,—a curve to which the base line is tangent at infinity. Diagrams 1, 3, 4, 5 and 8 suggest similar curves, although 1, 3, 4 and 5 illustrate death-rates from specific diseases instead of death-rates from all causes as do diagrams Nos. 7 and 8.

Doctrine of Malthus.—But there are always objectors, and there is one more very sweeping objection made to sanitation. This objection is dra from the doctrine of Malthus, that population tends to increase ir geometrical, and the means of subsistence in only an arithmetrical p gression. And that, as a result, population constantly tends to press u the limits of subsistence, and to over populate the world; that disease, and famine are the great positive checks to over population; and that

NO. 9.

NUMBERS OF DEATHS, BIRTHS AND PAUPERS PER 1000 POPULATION, PER ANNUM, IN ENGLAN



DES. AND DEL. BY GEO. E. WILLITTS.

the intellect of man succeeds in saving lives from disease, these will forced to die in war or by famine. Since the announcement of this d trine by Malthus, the ablest intellects of the world have been exerted u

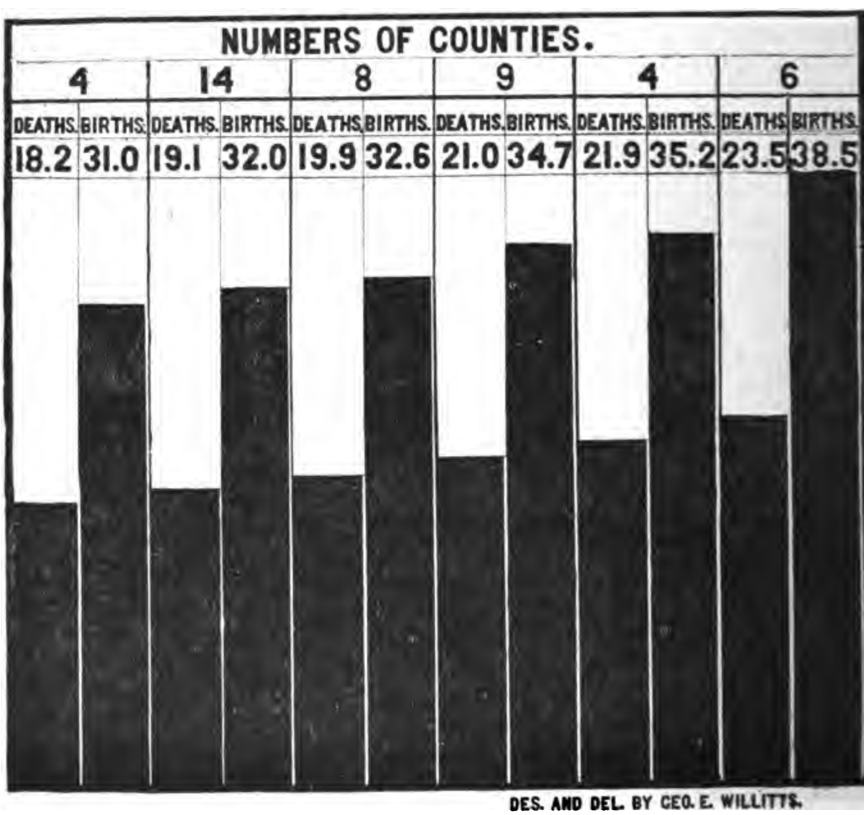
it. Macaulay accepted the doctrine; Mill did not accept it, as taught by Malthus; Sadler rejected it altogether; Spencer is rather reserved in his opinions on the subject; Darwin generalized the law,—applying it to the whole animal and vegetable kingdoms, but he considered man, by reason of his higher intelligence, an exception; Wallace does not consider that the Malthusian doctrine is true, with reference to man.

Bearing upon this subject I present two diagrams. The first (No. 9) exhibits, for England and Wales, the curves representing the death-rate and birth-rate during the 51 years, 1838–88, and pauper-rate during the 40 years, 1849–88. From this diagram it may be seen that the birth-rate seems to be falling off in response to a persistent decline in the death-rate. Further, it will be seen that instead of this reduction of the death-rate by improved sanitary conditions tending to crowd the people toward starvation, the pauper rate is actually decreasing.

The next diagram (No. 10) carries the evidence a step further. It represents the numbers of deaths and births per 1,000 population in England

NO. 10.

NUMBERS OF DEATHS AND BIRTHS PER ANNUM PER 1000 POPULATION IN ENGLAND BY GROUPS OF COUNTIES GRADED ACCORDING TO THEIR DEATH-RATES (30 YEARS 1851-80).



DES. AND DEL. BY GEO. E. WILLITTS.

(including North and South Wales) by groups of counties graded according to their *death-rates*, during a period of 30 years, 1851–80. It will be seen that not only do the death-rates in these groups of counties grade gradually upwards, but that the birth-rates also grade upwards in a similar way, and that in those counties where, because of good sanitary conditions, the death-rate is lowest, there also is the birth-rate lowest, and where the sanitary conditions are worst and the death-rate is highest, there also is the birth-rate highest; and the difference between the death-rate and birth rate is greatest in those counties where the death-rate is highest, and *the population is increasing least rapidly in those counties where good sanitatry conditions have produced the lowest death-rates.*[20] One reason for this is that he who takes sufficient forethought to bring about good sanitary conditions will take forethought in other directions and is not likely to contract the marriage relation before he is able to support a family, and he who is reckless in the latter will give little heed to sanitation.

I submit that the evidence presented in these last two diagrams sets aside the Malthusian doctrine so far as it has been applied as a criticism of sanitation. But if, now, we return to the diagram of the total death-rate in London (No. 7), we shall see further reason why the Malthusian doctrine cannot hold as a criticism of sanitation; because this diagram represents not only the death-rate from all diseases but also from all causes, including *war* and *famine*, and yet the *total death-rate* has been undergoing a most remarkable reduction during a period of more than two and a half centuries.

The reason is plain why public-health work, instead of increasing the pressure of population upon the limits of subsistence, tends strongly to relieve this pressure, and to reduce pauperism and prevent famine. For, according to the evidence presented in this diagram (No. 7), about 240,000 lives are annually saved in the city of London by modern sanitary measures. This means that the expense of 240,000 funerals is saved each year, which at the low estimate of \$30 each is \$7,200,000. For each death prevented there are about 10 cases of sickness prevented. Estimate the duration of sickness at the low average of ten days, and the money lost in wages, doctors' bills, medicine and nursing, at \$1 per day, and there is indicated a money saving of \$24,000,000. Estimate the future earnings of the 240,000 persons whose lives are saved, at \$200 each and this item amounts to \$48,000,000 annually. At these very low estimates the indicated annual saving in the city of London by sanitation reaches the enormous sum of \$79,200,000,—enough to relieve a considerable pressure upon the limits of subsistence.[21]

Conclusion.—The evidence presented in this diagram (No. 7) means a great deal. The reduction of the *total death-rate* in London from about 75.5 per 1,000 population in the seventeenth century to about 18.5 at present, means, as I have stated, the saving of about 240,000 lives each year in that city with its present population. This means that the average age at death in the seventeenth century was about 13.5 years, while the present

[20] In the unsanitary districts proportionally more are born, but more die; lives are much shorter, and there is far more sickness, suffering and despair than in those districts which are in good sanitary condition.

[21] It is also worth remembering in this connection, that, as in war, many who survive the wounds received in battle are maimed for life, or their health is permanently impaired, so, many who survive severe sickness never recover their former good health, or some organ is permanently injured or destroyed, as, for instance, the organs of sight or hearing are often either destroyed or permanently injured by some of the eruptive fevers.

death-rate implies, if continued, an average age at death of about 54 years,—that is, at the present death-rate the people of London, on an average, will live to be about four times as old as they did three centuries ago. This great reduction of deaths means an immensely greater reduction of sickness. This diagram demonstrates that a great load of sickness and deaths, with their accompanying pain, suffering and sorrow, has been lifted from the world by the evolution of sanitation. This is surely one of the greatest achievements of science, and, as I believe this is undeniably true, I think you will agree with me, that sanitary science is one of the greatest and most beneficent of all the sciences.

Nor is this all. The past is something of a prophecy of the future. The evolution of sanitation has not ceased. The last death-rate is the lowest recorded. Sanitary science is pressing forward in the full vigor and courage of youth, and seems now almost within reach of still more startling achievements.[22]

This is a prophecy of a good time coming when one can lay out reasonable plans with some confidence that he will live to realize them; when one may reasonably hope that his friends will go on through life to old age with him, and that he will not be prematurely bereft of his loved ones. It is a prophecy of a good time coming when sickness and death with their accompanying suffering and sorrow shall be reduced to the minimum, and when happiness will be something more than a fleeting dream.

APPENDIX.

TABLE 1.—*Exhibiting the average annual number of Deaths, per 100,000 persons living, in London, England, caused by typhus, typhoid, and simple and ill-defined Fevers, in periods representing the seventeenth, eighteenth, and nineteenth centuries.*[23]

1629-35. (7 yrs.)	1660-79. (10 yrs.)	1728-57. (30 yrs.)	1771-80. (10 yrs.)	1801-10. (10yrs.)	1831-40.[24] (8yrs.)	1841-50. (10yrs.)	1851-60. (10yrs.)	1861-70, (10yrs.)	1871-80. (10yrs.)	1881-88. (8yrs.)	1888.
681[25]	875[26]	785	621	264	120[24]	98	89	90	37	23	17

22 There is now a reasonable hope that sanitarians will soon be able to confer an immunity from many other diseases as effectually as immunity from small-pox is now conferred by vaccination. The aim is to obtain from the micro-organism, which causes a given disease, a product which when introduced into the blood of a person will protect him from that disease. In the case of tetanus (lock-jaw) this has already been accomplished in numerous cases even after the symptoms of the disease had developed (John S. Ely, M. D., Immunity, etc. Amer. Jour. Medical Sciences, Sept., 1893, pp. 371-76). Koch, Pasteur, Vaughan, Baginski, Tizzoni, and others, are working on this problem of conferring immunity.

23 The numbers of deaths in periods up to the year 1835 were taken from Dr. Farr's table ("Vital Statistics: A memorial volume of selections from the reports and writings of William Farr, M. D., D. C, L., C. B., F. R. S.," London, 1885, p. 304); for periods from 1838 forward they were taken from the Annual Reports of the Registrar-General of England.

24 The number given for the period 1831-40 is the average of the five years 1831-35 and the three years 1838-40 combined—data for two years wanting.

25 Of this number 45 were attributed to "spotted fever."

26 Of this number 90 were attributed to "spotted fever."

TABLE 2.—*Exhibiting for London, England, the Average Annual Number of Deaths caused by Cholera (Asiatic and simple), per 100,000 persons living, in periods representing the seventeenth, eighteenth and nineteenth centuries; also the death-rates for each of the 51 years, 1838–88.*[27]

Periods. Years.	Cholera death-rates per 100,000 persons living.	Years.	Cholera death-rates per 100,000 persons living.
7 years, 1629-35	63	1861	6.0
20 " 1660-79	148	1862	3.7
30 " 1728-57	1	1863	5.5
5 " 1831-35	135	1864	5.3
51 years, 1838-88	29.6	1865	6.5
1838	.9	1866	184.0
1839	2.0	1867	7.8
1840	3.3	1868	10.3
1841	1.5	1869	6.9
1842	6.2	1870	7.4
1843	4.4	1871	6.8
1844	3.2	1872	5.4
1845	2.1	1873	4.8
1846	10.8	1874	3.6
1847	5.2	1875	3.1
1848	29.1	1876	3.8
1849	619.6	1877	2.4
1850	5.5	1878	3.4
1851	9.0	1879	1.4
1852	6.7	1880	3.5
1853	35.9	1881	2.5
1854	428.9	1882	2.0
1855	5.8	1883	2.1
1856	5.8	1884	4.0
1857	8.1	1885	1.9
1858	4.9	1886	3.3
1859	7.1	1887	2.5
1860	1.8	1888	1.3

[27] The death-rates for periods up to the year 1835 were obtained from Dr. Farr's table, *op. cit.*; for the years 1838–88, from the Annual Reports of the Registrar-General of England.

TABLE 3. *Representing for London, England, the average annual number of Deaths caused by Consumption, per 100,000 persons living in periods representing the seventeenth, eighteenth, and nineteenth centuries.*[28]

1629-35. (7 yrs.)	1660-79. (10 yrs.)	1728-57. (30 yrs.)	1771-80. (10 yrs.)	1801-10. (10yrs.)	1831-40. (10yrs.)	1841-50. (10yrs.)	1851-60. (10 yrs.)	1861-70. (10yrs.)	1871-80. (10yrs.)	1881-88. (8yrs.)	1888. (1 yr.)
1,021	1,255	905	1,121	716	567	323	286	254	251	207	175

[28] The data for the periods up to 1835 were obtained from Dr. Farr's mortality table, *op. cit.*; the figures for the period 1840–54 were obtained from the first report of the Royal Commission appointed to inquire into the subject of vaccination, p. 88; the figures for the period 1851–60 were compiled from the journal of the Scottish Meteorological Society, July 1874–July 1875, p. 246; the data for the remaining periods were obtained from the Annual Reports (and Supplements) of the Registrar-General of England.

TABLE 4.—*Representing, for London, England, the average annual number of Deaths caused by Small-pox,*[29] *per 100,000 persons living in periods representing the seventeenth, eighteenth, and nineteenth centuries.*[30]

1660-79.[31] (10yrs.)	1728-57. (30yrs.)	1771-80. (10yrs.)	1801-10. (10yrs.)	1831-35. (5yrs)	1840-54. (15yrs.)	1855-59. (5yrs.)	1860-64. (5yrs.)	1865-69. (5yrs.)	1870-74. (5yrs.)	1875-79. (5yrs.)	1880-84. (5 yrs.)	1885-88. (4 yrs.)
417	426	502[32]	204	83	40	23.5	28	28	66	29	24	9

[29] Source of Data: The data for the periods up to and including 1835 were taken from the mortality table constructed by Dr. Wm. Farr, *op. cit.*; and for the periods from 1840 to 1888 the data were obtained from the Reports of the Registrar-General of England.

[30] General Note on Table 4.—The periods up to and including 1780 were before the introduction of the practice of vaccination, and the periods from 1801 to 1888 were since the introduction of vaccination, though the practice had not become very general during the period 1801-10. Dr. Edward Jenner announced his discovery, of vaccination as a protection against small-pox, to a friend, in the year 1780, but he did not publish his discovery until 1789. In 1790 upwards of 70 of the leading physicians and surgeons of London declared their entire confidence in vaccination as a protection against small-pox; its success was so generally recognized by 1802, that in that year Parliament granted Jenner £10,000, and in 1807 £20,000 more, for his services in this discovery.

In the periods from 1660 to 1780 there was no vaccination; in the periods from 1801 to 1853 vaccination was optional; from 1854 to 1871 it was obligatory, but not efficiently enforced; from 1872 to 1888 it was not only obligatory, but was more efficiently enforced by vaccination officers. The death-rate from small-pox underwent a continuous decline from 1801-60, but during the ten years 1860-69, it rose to 28 per 100,000 population, and during the next five years, 1870-74, it rose to 66, this increase being confined to those adult persons who had not been vaccinated since their infancy, and in whom the protection of vaccination seemed to have lapsed. A more vigorous system of vaccination and *re-vaccination* was commenced in the latter part of the period 1870-74, since which time the disease has undergone a continuous decline.

[31] Dr. Farr gives the death-rate from small-pox for another period, 7 years 1629-35, as 189 per 100,000 population; but he states that this period was "intercurrent between epidemic years."

[32] The death-rate from small-pox was at the maximum, 502 per 100,000, in the period 1771-80, when the practice of *inoculation of small-pox* had become most prevalent, the disease having been spread by those inoculated.

TABLE 5.—*Representing for the kingdom of Sweden, the average annual number of Deaths caused by Small-pox, per 100,000 living population in eleven periods during the 107 years 1749–1855. Compiled from the "First Report of the Royal Commission appointed to inquire into the Subject of Vaccination * * 1889."*

1749-61. (13 yrs.)	1762-71. (10 yrs.)	1772-81. (10 yrs.)	1782-91. (10 yrs.)	1792-1801. (10 yrs.)	1802-11. (10 yrs.)	1812-21. (10 yrs.)	1822-31. (10 yrs.)	1832-41. (10 yrs.)	1842-51. (10 yrs.)	1852-55. (4yrs.)
3,388[33]	3,490[33]	2,465	2,213	1,913	621	123	149	275	125	145

[33] From 1749 to 1773 the mortality from measles is included in the small-pox death-rate.

TABLE 6.—*Representing the approximate average annual number of Deaths caused by Small-pox, per 10,000 persons living, in various countries and cities, in periods before and since the introduction of vaccination.*[34]

Periods.		Territory.	Death-rates.	
Before.	Since.		Before.	Since.
121 years, 1660-1780	88 years, 1801-1888	London	44	6.5
25 " 1781-1805	41 " 1810-50	Berlin	34	1.8
50 " 1751-1800	50 " 1801-50	Copenhagen	31	2.9
30 " 1777-1806	44 " 1807-50	Austria and Salzburg	20	4.2
5 " 1776-1780	41 " 1810-50	Prussia	13	2.1
30 " 1777-1806	44 " 1807-50	Bohemia	22	2.2
30 " 1777-1806	44 " 1807-50	Moravia	54	2.6
30 " 1777-1806	44 " 1807-50	Silesia (Austrian)	58	2.0
5 " 1776-1780	35 " 1816-50	Westphalia	26	1.1
28 " 1774-1801	41 " 1810-50	Sweden	21	1.6

[34] The data for London were derived from table 3 of this article; the data for the rest of this table (6) were derived from a table presented to the Royal Commission on Vaccination by Sir John Simon, K. C. B., F. R. S.

TABLE 7.—*Representing, for London, England, the average annual number of Deaths from All Causes, per 1,000 persons living in periods representing the seventeenth, eighteenth and nineteenth centuries.*[35]

1620-43. (24yrs.)	1660-79. (20yrs.)	1728-57. (30yrs.)	1771-80. (10yrs.)	1801-10. (10yrs.)	1813-35. (23yrs.)	1841-50. (10yrs.)	1851-60. (10yrs.)	1861-70. (10yrs.)	1871-80. (10yrs.)	1881-87. (7yrs.)	1887. (1 yr.)	1888. (1 yr.)
70	80[36]	52	50	29.2	29.0	25.0	23.8	24.5	22.5	20.4	19.5	18.4

[35] The data for the periods of this table from 1660 to 1835 were obtained from Dr. Farr's table, *op. cit.*, and for the first period 1620-43, the data were obtained from statements of Dr. Farr relative to that table. The data for the periods from 1841 to 1888 were obtained from the Reports of the Registrar-General of England.

[36] This number, 80, includes 12 attributed to "plague," and 13 attributed to consumption. In 1665, a hundred thousand people of London are said to have died of "Black Death." In 1666 occurred the "great fire", which consumed much filth and destroyed many pest-breeding rookeries, and is believed to have otherwise greatly facilitated sanitary progress in London.

TABLE 8.—*Representing, for the kingdom of Sweden, the average annual number of Deaths by All Causes, per 1,000 persons living, in seven periods representing the eighteenth and nineteenth centuries.*[37]

1755-75. (21 yrs.)	1776-95. (20 yrs.)	1821-40. (20 yrs.)	1841-60. (20 yrs.)	1861-80. (20 yrs.)	1881-86. (6 yrs.)	1886. (1 yr.)
28.9	26.8	23.3	21.1	19.2	17.4	16.6

[37] The data for the periods up to 1860, in this table, were obtained from a table in the First Report of the Royal Commission appointed to inquire into the subject of vaccination, p. 86. The data for the rest of the periods were computed from Table 46, Fiftieth Annual Report of the Registrar-General of England.

TABLE 9.—*Representing the annual number of Births, Deaths and Paupers per 1,000 living population in England; the Births and Deaths being for the 51 years, 1838–88, and the Paupers for the 40 years, 1849–88. Obtained from the Annual Reports of the Registrar-General of England.*

Year.	Rates per 1,000.			Year.	Rates per 1,000.		
	Births.	Deaths.	Paupers.		Births.	Deaths.	Paupers.
1838	30.3	22.4	....	1864	35.4	23.7	43.8
1839	31.7	21.9	....	1865	35.4	23.2	41.9
1840	31.8	22.8	....	1866	35.2	23.4	40.5
1841	32.2	21.6	....	1867	35.4	21.7	42.5
1842	32.1	21.7	....	1868	35.8	21.8	43.6
1843	32.3	21.2	....	1869	34.8	22.3	43.4
1844	32.6	21.5	....	1870	35.2	22.9	43.5
1845	32.5	20.9	....	1871	35.0	22.6	41.6
1846	33.8	23.0	....	1872	35.6	21.3	36.9
1847	31.5	24.7	....	1873	35.4	21.0	33.9
1848	32.4	23.0	....	1874	36.0	22.2	31.5
1849	32.9	25.1	62.0	1875	35.4	22.7	29.7
1850	33.4	20.8	56.7	1876	36.3	20.9	27.5
1851	34.2	22.0	52.4	1877	36.0	20.3	27.0
1852	34.2	22.3	50.3	1878	35.6	21.6	27.3
1853	33.3	22.9	48.2	1879	34.7	20.7	29.0
1854	34.1	23.5	46.4	1880	34.2	20.5	28.4
1855	33.7	22.6	47.7	1881	33.9	18.9	28.2
1856	34.4	20.5	48.2	1882	33.7	19.6	27.2
1857	34.4	21.8	44.6	1883	33.3	19.5	26.5
1858	33.7	23.1	44.7	1884	33.3	19.5	25.8
1859	35.0	22.4	41.5	1885	32.5	19.0	25.7
1860	34.3	21.2	40.1	1886	32.4	19.3	26.2
1861	34.6	21.6	41.9	1887	31.4	18.8	25.8
1862	35.0	21.4	46.7	1888	30.6	17.8	25.6
1863	35.3	23.0	48.0				

TABLE 10.—*Average annual numbers of Deaths and Births per 1,000 population in the 45 registration counties of England Graded and Grouped according to their death-rates during the 30 years, 1851–80 (derived from table 11 of this article).*[38]

Registration county.	Rates in each county.		No. of counties grouped.	Rates in groups of counties.	
	Deaths.	Births.		Deaths.	Births.
Surrey	17.76	31.40	4	18.19	30.98
Dorsetshire	18.26	31.02			
Sussex	18.27	31.22			
Westmoreland	18.48	31.28			
Kent	18.78	32.66	14	19.10	32.00
Essex	18.78	32.89			
Hampshire	18.81	31.33			
Rutlandshire	18.83	31.44			
Hertfordshire	18.99	31.81			
Lincolnshire	19.02	32.87			
Herefordshire	19.04	29.65			
Huntingdonshire	19.06	32.92			
Berkshire	19.21	31.29			
Wiltshire	19.27	31.32			
Worcestershire	19.33	34.47			
Suffolk	19.40	32.19			
Somersetshire	19.44	30.74			
Oxfordshire	19.49	32.52			
Cambridgeshire	19.50	32.69	8	19.89	32.60
Buckinghamshire	19.57	33.35			
Middlesex	19.63	31.42			
Devonshire	19.87	30.44			
Shropshire	20.07	31.81			
Bedfordshire	20.09	34.20			
Gloucestershire	20.14	32.01			
North Riding	20.26	34.90			
Cornwall	20.57	32.61	9	21.00	34.65
Norfolk	20.61	31.47			
Northamptonshire	20.66	35.44			
Monmouthshire	20.99	36.99			
Derbyshire	21.11	36.84			
Leicestershire	21.14	35.92			
Nottinghamshire	21.21	36.06			
South Wales	21.25	35.98			
North Wales	21.45	31.02			
Warwickshire	21.71	37.06	4	21.92	35.22
Cheshire	21.84	35.11			
East Riding	21.02	34.71			
Cumberland	22.11	34.02			
Staffordshire	22.68	41.38	6	23.47	38.53
Durham	22.76	42.33			
Northumberland	22.83	36.76			
London	23.16	34.84			
West Riding	23.97	38.03			
Lancashire	25.44	37.85			

[38] The counties are arranged in this table according to their death-rates, beginning with the county having the lowest death-rate and following it with the county having the next higher death-rate, and so on, to the county having the highest death-rate, allowing the birth-rates to fall as they may. Then the counties thus graded are grouped as follows: All counties having death-rates falling between 17.50 and 18.50 are grouped together; and all between 18.50 and 19.50 are put in the next group; and all between 19.50 and 20.50 are included in the next group, and so on through the 45 registration counties, except that the last two counties, West Riding and Lancashire, each having a very high death-rate, separating them from the other groups and from each other, were included with the next group below, thus making the average for the last group differ from the next lower by considerably more than a unit. This table is illustrated by diagram No. 10.

TABLE 11.—*Average numbers of Deaths and Births per 1,000 population in each of the 45 registration counties of England during each of the ten-year periods, 1851-60, 1861-70, 1871-80, and during the 30 years, 1851-80; compiled from the Supplements to the Annual Reports of the Registrar-General of England.*

Registration county.	Av. annual death-rates.				Av. annual birth-rates.			
	1851-60.	1861-70.	1871-80.	1851-80.	1851-60.	1861-70.	1871-80.	1851-80.
London	22.49	24.5	22.5	23.16	33.72	35.4	35.4	34.84
Surrey	17.67	18.7	16.9	17.76	30.31	32.7	31.2	31.40
Kent	18.63	19.8	17.9	18.78	31.39	33.9	32.5	32.60
Sussex	18.81	18.8	17.2	18.27	29.65	30.9	30.1	30.22
Hampshire	19.02	19.1	18.8	18.81	31.38	31.4	31.2	31.38
Berkshire	19.72	19.8	18.1	19.21	30.16	31.9	31.8	31.29
Middlesex	19.98	20.5	18.4	19.63	30.17	32.0	32.1	31.42
Hertfordshire	19.47	19.1	18.4	18.99	31.34	32.1	32.0	31.81
Buckinghamshire	19.81	20.3	18.6	19.57	33.24	33.8	33.0	33.35
Oxfordshire	19.66	19.9	18.9	19.49	33.07	32.9	31.6	32.52
Northamptonshire	21.37	21.0	19.6	20.66	36.13	35.4	34.8	35.44
Huntingdonshire	18.67	20.1	18.4	19.06	33.77	33.4	31.6	32.92
Bedfordshire	20.17	20.7	19.4	20.09	33.80	35.3	33.5	34.20
Cambridgeshire	19.50	20.3	18.7	19.50	33.08	32.7	32.3	32.69
Essex	18.64	19.6	18.1	18.78	32.38	32.9	33.4	32.89
Suffolk	19.71	19.7	18.8	19.40	32.08	32.4	32.1	32.19
Norfolk	21.02	21.1	19.7	20.61	31.62	32.0	30.8	31.47
Wiltshire	20.01	19.3	18.5	19.27	31.26	31.6	31.1	31.32
Dorsetshire	18.68	18.7	17.4	18.26	31.83	31.7	29.5	31.01
Devonshire	19.71	20.3	19.6	19.87	30.13	31.3	29.9	30.44
Cornwall	20.40	21.0	20.3	20.57	33.74	33.9	30.2	32.61
Somersetshire	19.63	19.6	19.1	19.44	30.52	30.7	31.0	30.74
Gloucestershire	19.51	21.1	19.8	20.14	31.23	32.3	32.5	32.01
Herefordshire	19.12	19.8	18.2	19.04	29.75	30.4	28.8	29.65
Shropshire	21.12	20.3	18.8	20.07	31.48	32.8	31.2	31.81
Staffordshire	21.94	23.5	22.6	22.68	41.65	41.1	41.4	41.38
Worcestershire	18.78	20.2	19.0	19.33	34.30	34.8	34.3	34.47
Warwickshire	20.48	22.7	22.0	21.71	37.07	36.6	37.5	37.06
Leicestershire	19.62	22.0	21.8	21.14	34.77	35.8	37.2	35.92
Rutlandshire	19.09	19.0	18.4	18.83	32.98	30.7	30.7	31.44
Lincolnshire	19.36	19.1	18.6	19.02	33.01	33.0	32.6	32.87
Nottinghamshire	20.54	21.7	21.4	21.21	37.09	34.2	36.9	36.06
Derbyshire	21.08	21.6	20.7	21.11	35.22	36.0	37.8	36.34
Cheshire	21.73	22.6	21.2	21.84	34.44	35.6	35.3	35.11
Lancashire	23.71	27.2	25.4	25.44	36.76	38.1	38.7	37.85
West Riding	23.60	24.9	23.4	23.97	37.59	38.1	38.4	38.03
East Riding	21.85	22.7	21.5	22.02	34.22	34.5	35.4	34.71
North Riding	20.27	20.5	20.0	20.26	34.29	33.9	36.5	34.90
Durham	20.98	23.8	24.0	22.76	41.10	42.0	43.9	42.33
Northumberland	22.18	23.5	22.8	22.83	35.09	37.0	38.2	36.76
Cumberland	22.42	22.3	21.6	22.11	32.77	34.1	35.2	34.02
Westmoreland	19.75	18.0	17.7	18.48	32.53	30.2	31.1	31.28
Monmouthshire	20.26	21.8	21.9	20.99	36.76	36.3	37.9	36.99
South Wales	21.16	21.4	21.2	21.25	35.85	35.7	36.4	35.98
North Wales	22.25	21.5	20.6	21.45	29.96	31.7	31.4	31.02

DISCUSSION.

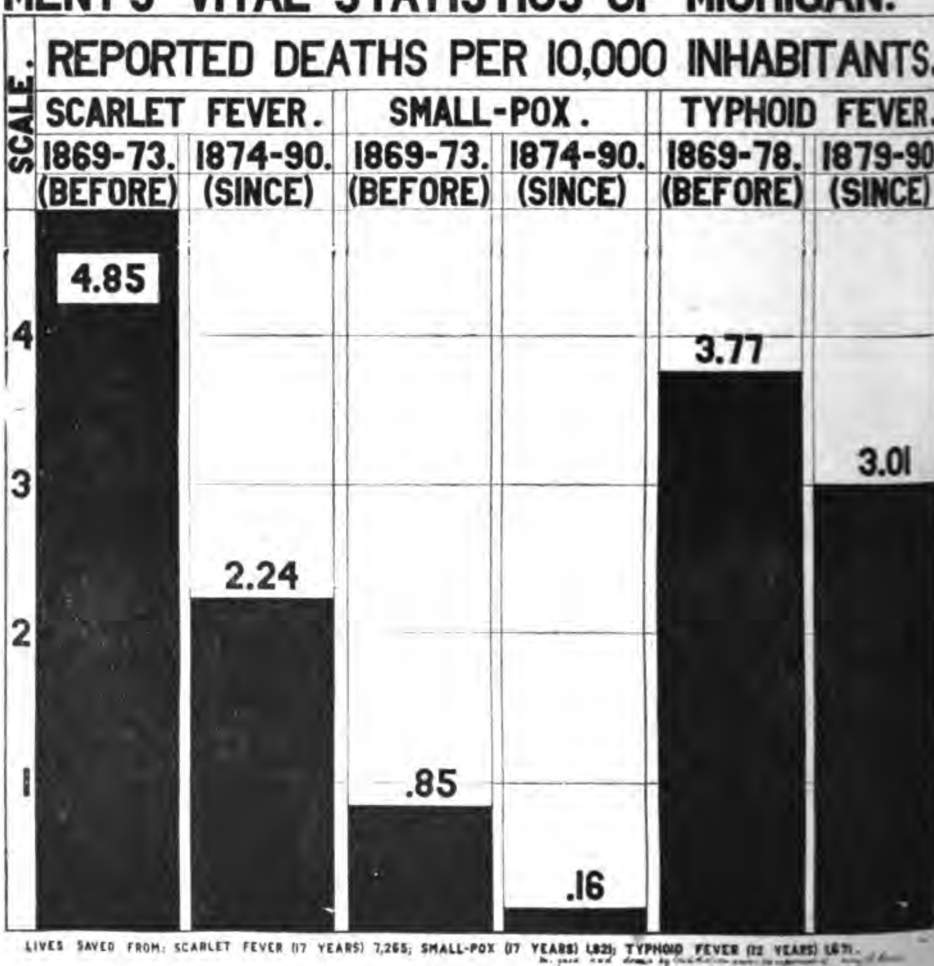
Dr. Gier—I would like to ask Dr. Baker the same question I asked Mr. Willitts,– if he has statistics or if he knows, what has been the effect of sanitary science in Michigan on the average life of man, whether it has increased over, say, ten or fifteen years ago

Dr. Baker—Mr. President, ladies and gentlemen, I don't think that the statistics of mortality in Michigan are just now in a condition to answer that question directly; but indirectly we can answer it. Preparing for the Columbian Exposition, we obtained from the office of the Secretary of

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

LIVES SAVED BY PUBLIC-HEALTH WORK.

COMPARISON OF DEATH-RATES IN MICHIGAN FROM SCARLET FEVER AND SMALL-POX BEFORE AND SINCE THE STATE BOARD OF HEALTH WAS ESTABLISHED AND FROM TYPHOID FEVER BEFORE AND SINCE ITS RESTRICTION WAS UNDERTAKEN BY THE STATE BOARD. COMPILED FROM STATE DEPARTMENT'S "VITAL STATISTICS" OF MICHIGAN.



LIVES SAVED FROM: SCARLET FEVER (17 YEARS) 7,265; SMALL-POX (17 YEARS) 1,821; TYPHOID FEVER (12 YEARS) 1,671.

State the mortality statistics before and since the establishment of certain measures in the State of Michigan, and prepared a diagram.* I have a number of copies here for distribution; and I have in mind some of the facts in that diagram. The mortality statistics of the State department of Michigan show that previous to the establisment of the State Board of Health, the death-rate from scarlet fever was 4.84 for every ten thousand living in Michigan. Now, statistics of the same department, collected in the same manner, show that since the State Board of Health has been engaged in endeavoring to restrict that disease, scarlet fever, the death-rate has averaged 2.24, less than one-half of what the death-rate was before; one-half of the deaths from that very dangerous disease in Michigan has disappeared. Last evening I distributed diagrams, and there is a diagram, † hanging in that corner, it shows the way in which that reduction was brought about. It has been brought about by two measures, one of them at least referred to by Mr. Willitts; first, isolation of the infected person; second, disinfection of all infected things, after the death or recovery of the patient. The sickness statistics in Michigan, collected in Michigan by the State Board of Health, show that the sickness from scarlet fever has been reduced about one-half; thus the statistics from our department correspond with the statistics of the State department in proving a reduction of scarlet fever.

Our statistics, which we collect in another way, which I have referred to, prove that in those places in which the measures which we recommend, isolation and disinfection, have been successfully employed, four-fifths of the cases and deaths are prevented. Now, when the methods recommended by the State Board of Health are carried out throughout the State, not merely one-half of the deaths, but four-fifths, will be prevented. There is something ahead of us to do with reference to scarlet fever; but it is gratifying to know that in Michigan, as well as in other parts, there has been a great reduction in mortality from certain diseases.

This afternoon there was distributed in the audience here a diagram‡ illustrating the reduction in the sickness in Michigan through another measure with which the State Board of Health has had little to do, although it has done what it can in that line,—a reduction of sickness in Michigan from intermittent fever, between the two periods shown there,—a reduction of nearly half the sickness in ten years.

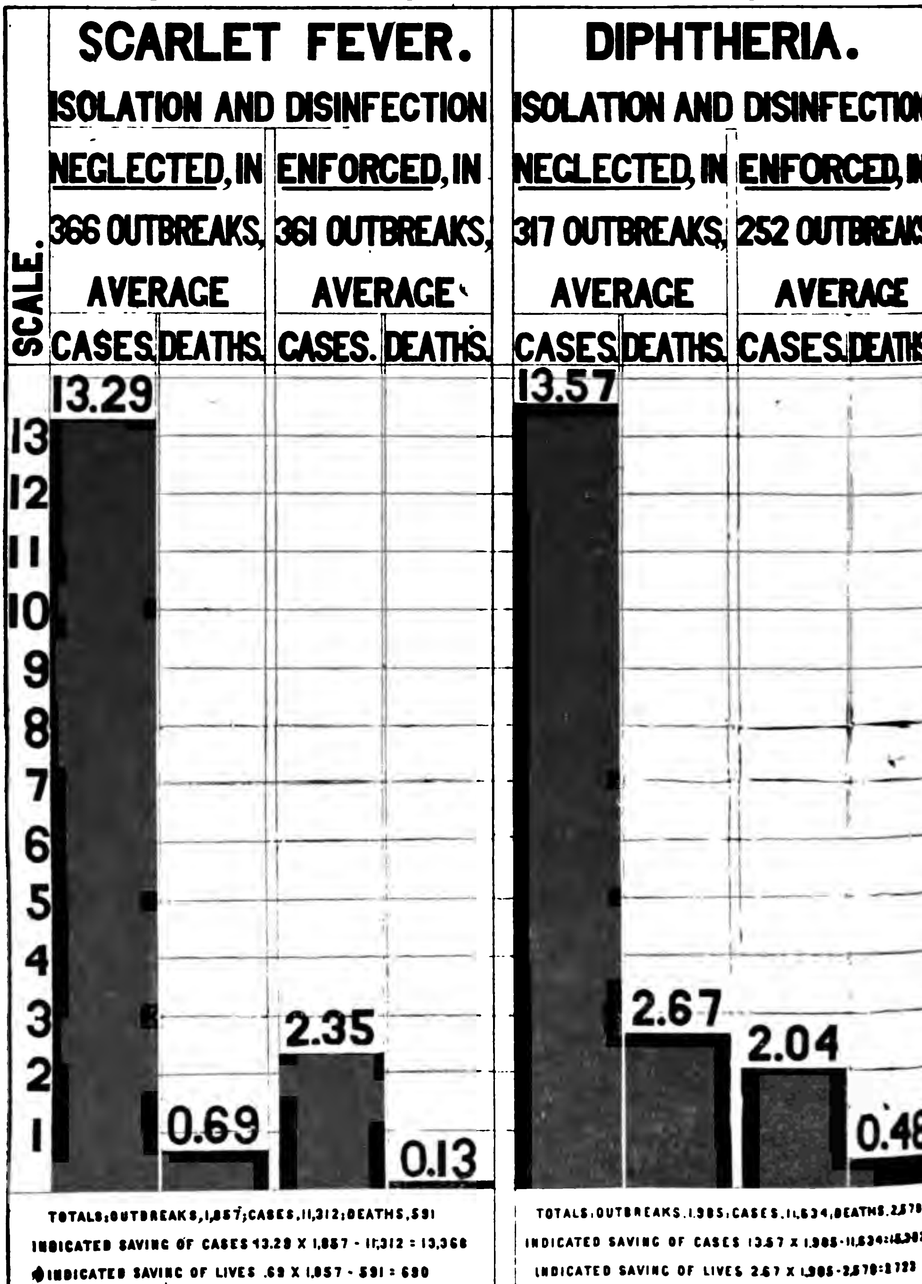
On this diagram I have just referred to,—"Lives Saved by Public Health Work",*— another disease is represented—small-pox. Mr. Willitts has shown how the reduction in small-pox has been brought about. I want to say that in this State of Michigan, the statistics in the State department show that previous to the organization of the State Board of Health, the death-rate from small-pox—I won't pretend to give the exact figures from memory, but more than three-quarters of the small-pox has disappeared. It has disappeared to a greater extent than has scarlet fever, for the reason that we not only have the method of isolation and disinfection, but we have in addition to that this great discovery to which Mr. Willitts has referred, *vaccination*.

In Michigan there has been a great reduction in another disease concerning which we have said a great deal here today, because it is a very important topic, and that is typhoid fever. There wasn't a reduction in

*The diagram "Lives Saved by Public Health Work" is printed on page 108.
†The diagram is printed on page 110.
‡p. 53.

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

ISOLATION AND DISINFECTION RESTRICTED SCARLET FEVER AND DIPHTHERIA IN MICHIGAN DURING THE 5 YEARS 1886-90.



the death-rate from typhoid fever immediately after the State Board of Health was established, for the reason that the State Board of Health did not commence its work on that disease then. It would have been impossible under those circumstances to have worked very successfully; but as soon as it could, the State Board commenced its work on typhoid fever, and its relation to the water in wells, and so on, the State Board of Health of Michigan continued its work on the restriction of that disease, and by the statistics of the State department before and since the State Board of Health has been laboring to control that disease, it is shown that there has been a great reduction in that disease; we expect the work of reduction to go on more rapidly in the future than it has in the past.*

The following resolutions were offered, and upon motion were unanimously adopted:

WHEREAS, The people of Hillsdale, by their presence during the different sessions of this convention, have exhibited the interest they have taken in the different topics that have been under discussion, and in the deliberations of this convention, and

WHEREAS, They desire to give formal appreciation of the work of the convention and the profit they have received therefrom; therefore, be it

Resolved, That the citizens of Hillsdale tender to Dr. Baker and the other members of the State Board of Health their most sincere thanks for giving us this convention, and for their able and wise counsel for our welfare; and

Resolved, That we extend a vote of thanks to the local board of health which has served as the local committee for this convention, to the President of the convention, and those who have so kindly rendered music, to the trustees for the use of this beautiful church, and to all who have assisted to make these sessions so pleasant, profitable and successful.

Dr. Baker—On behalf of the State Board of Health, I wish to express our appreciation of the interest that you have manifested here, and to say that if any of you wish to continue the study of sanitary affairs in any special line, and you can be aided by the publications of the State Board of Health, that the office will be pleased to send you the publications whenever you ask for them. The State Board of Health also publishes in pamphlet form the proceedings of these conventions, as they occur every year, and if any of you would like them, if you will send a postal card addressed to the office of the State Board of Health at Lansing, it will bring them. That is what they are published for, and we shall be pleased to be informed by anyone who wishes to receive the publications.

The Convention then adjourned.

* The reduction shown already is exhibited in the diagram on page 108.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

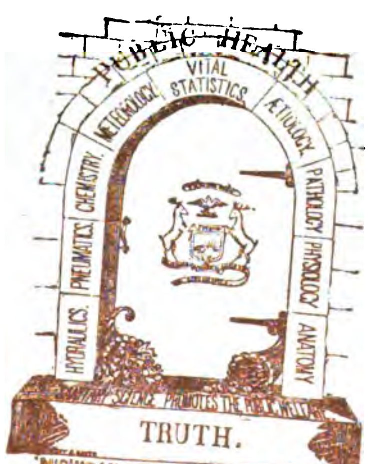
MENOMINEE, MICHIGAN,

APRIL 5 AND 6, 1894.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF MENOMINEE.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1894.]

[No. 404]



MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY

LANSING
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS
1894

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

MENOMINEE, APRIL 5 AND 6, 1894.

SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR THE YEAR 1894.

[No. 404.]

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

MENOMINEE SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES, AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT MENOMINEE, MICH.,

APRIL 5 AND 6, 1894.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR 1894

PETITION FROM THE CITIZENS OF MENOMINEE.

To the State Board of Health, Lansing, Mich.

GENTLEMEN:—We, the undersigned, residents of the city of Menominee, Michigan, respectfully petition your Honorable Body for the holding of a Sanitary Convention in this city at such time as you may appoint, during the present winter, and hereby tender you the use of proper accommodations for the holding of such convention, believing that the holding of such convention here will result in great good, not only to this city, but to the entire Upper Peninsula:—

H. L. Rosenberry, H. O.
Byron Taylor, M. D., Mayor.
A. L. Sawyer, City Attorney.
Sawyer, Waite & Waite, Lawyers.
John F. Hicks, M. D., Member City Council.
H. O. Fifield, Editor Herald.
B. T. Phillips, M. D.
Eugene Geipew, M. D.
Pauls & Henry.
G. N. Taylor, Alderman.
Geo. E. Wilde, Supt. Menominee Water Co.
L. M. Packard, Real Estate.
The Evening Leader Publishing Co., by J. S. Saults, Publ. The Evening Leader and Menominee Democrat.
Peter Sibenaler.
Henry Woessner, County Clerk.
Dunning Bros. & Co.
John Hibs, P. M.
Benno Dunham & Co., Clothiers.
E. S. Prindle, M. D.
Ellsworth & Lewis, Druggists.
I. M. Opsahl, Lawyer.
S. B. Chase, General Secretary of Young Men's Christian Association.
John Currer, Pastor Presbyterian Church.
R. J. Sawyer, Pharmacist.
Fred M. Stephenson, Lumberman.
Leisen & Henes Brg. Co.
Christophersen & Amundren, Jewelers.
Wm. A. Pengilly, Books & Stationery.
Alderman Robert S. Grocock.

Angus F. McGillis.
Frank Golueke.
Philip Harte, Dealer in Boots and Shoes.
Joseph Lemieux, Architect.
John Joiner & Co., Merchants.
F. Hibbard, Druggist.
C. S. Eastman, Pastor M. E. Church.
M. Durocher, Boots and Shoes.
A. B. BeDell, Alderman 3d Ward, Pres. *pro tem* City Council.
P. J. Noer, M. D., 713 Main St.
W. N. Salisbury, M. D., 432 Main St.
Nelson Baker, Alderman 6th Ward.
R. C. Perelstein, Merchant.
Rev. M. Faust, Pastor.
Menominee Hdw. Co., Ltd.
Ludington, Wells & Vanschaick Co.
C. H. Crawford & Crawford Mfg. Co.
Rev. D. Cleary, Pastor St. Johns.
H. A. Vennema, M. D.
Dr. Walter R. Hicks.
D. M. Wilcox, D. D. S.
A. Beland, Alderman 2d Ward.
Jesse Hubbard, Supt. of City Schools.
Menominee Volksfreund.
Smith & Petersen, Home Furnishers.
J. E. Cameron.
M. S. Carmon, Cashier.
L. Nelson, Alderman.

I could have secured many more if I had had time to devote to it, but I think this enough to convince the Board, that our people would like to have them.

H. L. ROSENBERRY, *Health Officer.*

LETTER OF REGRETS FROM HON. H. O. FAIRCHILD, A VICE PRESIDENT OF THE CONVENTION.

MARINETTE, WIS., *April 4, 1894.*

H. L. ROSENBERRY, M. D., *Secretary, etc., Menominee, Mich.*

DEAR SIR:—I am in receipt of the programme of exercises adopted for the Sanitary Convention to be held at Menominee on Thursday and Friday of this week, by which it appears that I have been named as one of the Vice Presidents. I have but recently returned home after an absence of about three months, and find that the matters which demand my immediate attention are so numerous as to make it impossible for me to give any time or attention to the proceedings of the convention. I wish to state however, that the objects of the convention meet with my hearty approval, and I hope that the discussion of the different subjects proposed will result in great good.

I am very sorry indeed that I am compelled to forego the pleasure of being present during the proceedings of the convention, and listening to the papers and addresses which will be presented to it.

Respectfully yours,

H. O. FAIRCHILD.

This Convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Menominee, acting with a committee of the State Board of Health.

The following named persons constituted the various Committees:—

Committee from the State Board of Health.—Prof. Delos Fall, M. S., Albion.

Local Committee.—B. Taylor, M. D., Chairman; Prof. J. W. Bird, Walter H. Hicks, M. D., H. A. Vennema, M. D., R. G. Morimer, M. D., Nelson Baker, A. L. Sawyer, Ald. Grocock, Rev. F. J. Mallett, and H. L. Rosenberry, M. D.

Executive Committee.—Henry B. Baker, M. D., Chairman, Byron Taylor, M. D., and H. L. Rosenberry, M. D.

Reception Committee.—M. J. Quinlan, W. S. Carpenter, and H. L. Rosenberry, M. D.

Music Committee.—Ald. Grocock, H. A. Vennema, M. D., and H. L. Rosenberry, M. D.

The Officers of the Convention were:—

President.—Hon. Byron Taylor, M. D., Menominee.

Vice Presidents.—Hon. A. L. Sawyer, Menominee; H. M. Mann, M. D.,

Marinette, Wis.; Nels Christophersen, Menominee; Hon. Joseph Fleisham, Menominee; M. S. Harmon, Menominee; Judge William Somerville, Menominee; Hon. H. O. Fairchilds, Marinette, Wis.; E. Grignon, M. D., Menominee; Rev. Father Faust, Menominee; A. Spies, Menominee; S. P. Jones, M. D., Marinette, Wis.; Rev. H. Hilleman, Menominee; and P. O'Keef, M. D., Oconto, Wis.

Secretary.—H. L. Rosenberry, M. D., Menominee.

Some of the persons not residents of Menominee, who were in attendance, were as follows:—U. O. B. Wingate, M. D., Health Commissioner of Milwaukee, Member Wisconsin Board of Health; J. T. Reeve, M. D., Secretary Wis. State Board of Health, Appleton; Dr. Solon Marks, President State Board of Health, Milwaukee; Dr. Hancock, Ellsworth, Wis.; Dr. J. H. Slaughter, Green Bay, Wis.; Dr. Ault, Oshkosh, Wis.; Edward Sawbridge, Stephenson, Mich.; Dr. P. O'Keef, Onconto, Wis.; Dr. J. A. Somerville, Marinette, Wis.; Dr. C. F. Larson, Iron Mountain, Mich.; Hon. Frank Wells, President State Board of Health, Lansing; Prof. Victor C. Vaughan, M. D., Member of State Board of Health, Ann Arbor, Michigan; Mason W. Gray, M. D., Member of State Board of Health, Pontiac, Michigan; Prof. Delos Fall, M. S., Member of State Board of Health, Albion, Michigan; and Henry B. Baker, M. D., Secretary State Board of Health, Lansing, Michigan.

FIRST SESSION, THURSDAY, APRIL 5, 2:30 P. M.

The Convention was called to order by President Taylor, Mayor of the City, who delivered the following Address of Welcome:—

ADDRESS OF WELCOME.

BY BYRON TAYLOR, M. D., MAYOR, MENOMINEE, MICH.

MR. PRESIDENT, LADIES AND GENTLEMEN: Your City Council, who constitute the Board of Health of this city, after due consideration, have thought it proper and advisable, to call you in Convention, together with members of the State Board of Health, and other able and worthy gentlemen, to consider and discuss questions relating to sanitary science.

We believe, that, out of this consideration and discussion, not only those present at our meetings, but the city, will reap a benefit.

We propose to make the meetings both interesting and instructive. And while it is made my duty on this occasion, to welcome you here, I regard it more a pleasure, for I am indeed proud to have the honor to welcome you, to this, our first Sanitary Convention; may other conventions follow in due time, and each surpass the last, that our people may be *educated* in this, I must say, neglected branch of science, without some knowledge of which, we have no right to boast of being a progressive people, or even to declare ourselves up with the times.

Again I extend to you all a most hearty welcome, and *through you* let me invite *your neighbor* to come and assist us in making this convention a grand success.

RESPONSE, AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY HON. FRANK WELLS, PRESIDENT OF STATE BOARD OF HEALTH LANSING.

One of the chief purposes of the Sanitary Conventions held under the auspices of the Michigan State Board of Health may be broadly stated to be the dissemination of the knowledge gained in sanitary science during the last twenty-five years, and the application of this knowledge to the conditions existing where such conventions are held, to the end that thereby lives may be saved and sickness prevented.

Knowledge of the causes and prevention of disease becomes valuable in proportion as it becomes popular. Real progress in sanitary science cannot be measured alone by what investigators in laboratories are learning, but by what you and I know of such learning and by the use made of it by our health officers and sanitary engineers. A sanitary convention is not expected to be composed of sanitary experts alone, but by all classes and ages of men and women. The subjects discussed are of interest and value to every human being. They relate to the causes of disease and death, and furnish information which, if used as it may be, will diminish the number of premature deaths more than one-half and diminish in still larger proportion the pain and suffering of humanity.

Neither is it a sanitary convention composed of physicians met for the purpose of discussing the best means of inducing disease, after it has gained possession of us, to relax its hold. While the members of the medical profession are with us in a large number today they do not come for *this* purpose. They come to give us the benefit of their knowledge and experience in the prevention, and not the curing, of disease.

It is a credit to this profession that so many of its more intelligent members are employed in this preventive work, for the business in which they are engaged and from which they obtain a livelihood must suffer in direct proportion to advances in knowledge of sanitary science and the application of sanitary methods to our daily lives. We meet them today to confer with each other and each to give to his neighbors the benefit of whatever knowledge he may have obtained on this most vital subject, the prevention of disease, and to apply this knowledge to the improvement of the sanitary condition of this beautiful city. It is greatly to the credit of a community that its members are sufficiently intelligent to realize that such conditions may be improved and that they take this means to accomlish this result.

But there are other objects sought to be gained by the holding of sanitary conventions much broader in their scope and far reaching in their consequences than the local one I have just stated.

The Michigan State Board of Health have always in view one or more designs for promoting the public health, requiring for their success the education of people in sanitary matters.

Two of these, which they are seeking to accomplish at the present time, are the restriction and the eventual stamping out of the disease which causes most deaths in the human family, tuberculosis; and the education of youth in the rudiments of sanitary science in our schools and colleges.

Both these are of the highest importance, both may be accomplished, and both depend for their success largely upon popular opinion. Meetings like this, whenever held, tend to make this opinion.

By means of conventions like this we can reach and appeal to this intelligence and confidently count upon its exercise to aid in every feasible plan for the public good.

Were our country threatened by an invading army an appeal to its patriotism would not be in vain.

Should an appeal to this emotion be less regarded when the foes are already in our midst, unseen, insidious, but far more dangerous than armed soldiery?

Today, as the foes of life are shown to you and their methods of destruction explained, we hope the same ardor which would induce you to resist the assaults of a human enemy, will inspire you to strike down more potent, if invisible, rivals. We confidently believe you will do so and that this convention will not only result in great good to your enterprising city; but will do something toward awakening a general interest in that subject of supremest importance to humanity, human health. When this awakening becomes general, as it surely will, the dawn of the millenium of health will appear; and the ideal condition of human life will be attained. In that day men and women will not droop and perish in the bud or flower of their existence; but they will live on to be gathered like the ripened grain in harvest, and weeping shall give place to joy.

No action this Board may take to accomplish the objects it has in view, whether especially sanctioned by statute or not, will bear fruit unless sustained by the intelligence of the community.

ADDRESS BY THE PRESIDENT OF THE CONVENTION.

BYRON TAYLOR, M. D., MENOMINEE.

LADIES AND GENTLEMEN:—It would seem from our program, that nearly every particular and distinct branch of sanitary science, had been assigned for discussion to able gentlemen. That there is no particular theme or subject left, on which I can be expected to talk much, without stepping on occupied grounds, and interfering with the rights and privileges of those worthy gentlemen who, in response to invitations from our board of health, have presented themselves here, no doubt well prepared to enlighten you all; and who expect to be themselves equally entertained, by those who have been assigned especial work. And yet, ladies and gentlemen, by your permission and indulgence, I believe that I may say a few words upon a subject pertaining to health, that may at least open discussion and create new thought, in a particular direction, out of which discussion and thought, much good may come to us all.

We will name the subject, then, *Digestion*; and whereas we leave for one of our members the privilege, and make it his duty to dwell upon, what a man should eat—to another what a man may find in food which should not be there, and perhaps what quantity a man may eat of the different kinds of food, with the many reasons why he should not gormandize; and even mention the consequences that may come to him because of eating too great a quantity, or because of eating a kind of food that is not good for

him; or eating food filled with germs of disease; and where and how these germs originate.

We will consider another part of this same subject, which I believe is too often overlooked by us all; that part is, when a man should eat. Many of the lower animals, fowls, birds of the air, wonderfully endowed with instinct, are capable of discriminating apparently without thought, as to what they should eat, and strange to say, they seem to know when they have enough. They are created with two stomachs, one a receptacle for food, while the other is more an organ of digestion; hence capable to gather food when and wherever they may find it; while the human being is provided with but one stomach, less instinct, but supposedly better sense, reasoning power, thinking qualities, brains, being actual master over the lower animal creation, but I am afraid not absolute master of himself. The human stomach is not only the receptacle of food, but a part of our anatomy where food is intended to remain for a time, and in that stomach, and during that time, to undergo certain changes which are termed digestion.

At this point let me say that to go through all, and discuss the whole process of digestion, chymification, chylifaction, intestinal digestion, assimilation, etc., would not only take up more time than is allotted us here, but is a subject better suited to a medical convention. We will therefore only discuss that part which I believe you will agree with me belongs to sanitary science.

The mother in feeding her child, the doctor in advising the diet for his patient, take well into consideration what the child or the patient should eat, and see to it that it is properly cooked, that it contains no impurities; they do not forget that a reasonable quantity is enough; but, ladies and gentlemen, I am bold to say they do forget *when* to feed them. The human stomach can not well digest two meals at one time. Let the subject be young, old, sick or well, his stomach should receive as to quantity, what its condition will warrant, of a kind, and of a quality suited to age or physical condition, and during the natural process of digestion it is not proper to interfere in any way. That it actually takes time for this natural process, no one disputes, but many forget. That when a stomach is deranged from any cause, it takes more time than when in a healthful condition, no one disputes, but more than many forget.

Divide the process of digestion then into two parts, namely the first and the last half; we can simplify and demonstrate perhaps more fully the reasons why it is not proper nor conducive to health, to feed any human stomach again, while it is in process of digesting the last quantity put there.

The first half of digestion, we find to be an acid change, usually termed fermentation, or chymification, whereas the last half of digestion is, in chemical reaction, exactly opposite, an alkaline change usually termed chylifaction.

Now it is because the first half of digestion is an acid change, and the second half an alkaline change, that it becomes impossible for the two changes to go on in the same stomach at one time, any more than you can expect vinegar and saleratus to undergo the change which takes place when they are thrown together in one receptacle, without creating gas, as a product of chemical union. Acids and alkalies are generally known to be, chemically, antagonistic. Digestion then may be termed a chemical change, and the function of digestion subject to the laws of our Maker, is truly wonderful, capable to endure more abuse than any other function of our body.

Yet there is a limit to its endurance, and through the medium of our nervous system, we sooner or later learn that if we violate those laws, nature will call out loudly for reformation as to our habit of eating. No organ of the human body is more universally abused than the average human stomach. Why, ladies and gentlemen, you will eat almost any time. You will feed your child almost any time. You will feed the sick one a little at a time and too often for his good. If it be a child you will feed it more often when it is sick, than when it was well, regardless of the fact that it takes its stomach more time to do its work in sickness, than it does in health, even if you know that the seat of its ailment is its stomach, you will thoughtlessly give that stomach another mess to contend with, and then another; and, half crazed with anxiety for its welfare, you will conclude that the food is not good—that it must contain some impurity poisonous to its nature; the milk-man must have changed the milk, or he has mixed it with other milk.—O! what will I do! Your neighbor advises that kind of food which their baby was successfully brought up on, and you try it with a vengeance; you leave that infernal bottle contrivance in its mouth day and night, and do many other things which seem to indicate that you never think that your baby is a *human* being, that it has but one stomach, and subject to the laws of nature, or even try to learn what those laws are.

One may say; I'm not a doctor! I am not supposed to know these things! True, but you have a stomach of your own, and few of you can boast of not having had some experience with it, that reminds you just now that it was not what you ate on a certain occasion, but because you ate some more when t'other was partly digested, that did you mischief. Let me suggest a test as to the truth of this which some of you may call a theory—and you are the ones whom I would ask to try it. Drink a glass, or even one-half a glass, of absolutely pure milk every hour for twenty-four successive hours (certainly this can be no hardship, for you ask the baby to do the same thing). The chances are you will learn the lesson if you are not a doctor, or even an acute observer.

You will learn that, if you persist in violating the laws of digestion, by eating too often, you will pay the penalty with suffering, fever, and possible death. Therefore, ladies and gentlemen, it is as sanitary, it is as conducive to health, to observe the laws of digestion as to *time*, as to pick out the germs of disease from your food, or to stop eating when you have enough.

To what extent this law is violated, to be sure, by some more than others, you will be surprised after thinking the matter over. Not only the free lunch fiend, but the lady afternoon tea party, the fourth of July pleasure seeker, the child who asks us for pennies or nickels to buy candy, peanuts or fruit, the birthday party, the picnic, the excursion, the cook—all do not forget the time when at midnight one of the family had to go for your doctor, and spoil his rest by going. Sometimes to administer to your stomach ache the doctor will say: "If you don't quit this foolishness, you'll ruin your stomach. Why, you use your stomach with less respect than you have for a slop jar. If you should use a shoe-pack that way it wouldn't last a week. If you would only take my advice as well as you take my medicine," etc., etc., etc., and before he leaves your house, the doctor himself will not refuse almost any refreshment you may offer, for he does not practice what he preaches.

Ladies and gentlemen, I thank you for your indulgence.

THE GERM THEORY OF DISEASE.

BY HON. J. F. HICKS, M. D., MENOMINEE.

MR. PRESIDENT, LADIES AND GENTLEMEN:—There probably never was a time when the preservation of health and the prevention of disease was so universally discussed, or a subject of such general interest to all classes of the people as the present. Nor do I believe our efforts in that line were ever rewarded with greater success or more intelligently directed. I attribute this largely to the fact that our knowledge of disease and its causes is greater and more rational than at any former time. So that we are better equipped to battle against it intelligently.

The cause of disease is one of those things that must have engaged the attention of men from the earliest times. From the morning of our race. So soon as the developing human mind was capable of thought and reflection, so soon as human sympathies found a lodgment in the breast of man, the sight of suffering, pain and disease would naturally suggest to him the question—Whence comes it? What causes the pain, the fever, the wasting and the delirium? He saw his loved ones stricken by some unseen and unknown power and taken from him, he saw the pestilence break out among his fellows, he saw it sweep them away by its poisoned breath; he saw that it spared neither the young nor the old, the rich nor the poor, the chief nor the beggar, the priest nor the slave. He saw families and tribes wiped out, and the destinies of nations changed, while he stood by stricken with hopeless fear and despair, unable to help or save his friends, to prevent or see the approach of the enemy, or tell what it was.

And as in all ages, men have relegated to the field of the supernatural those things they found themselves unable to explain; the, to them, mysterious cause of disease, found no exception, in despair and terror in the midst of the pestilence he lifted up his hands and called upon his numerous Gods for deliverance and protection. The consequence of such a belief naturally led men to think that prevention and cure were only to be obtained by prayer and fastings, sacrifice and burnt offerings made to appease the anger of their offended divinities.

Coming down to the border land between legendary and historical times we find this the universal belief of man. Homer tells us that when the pestilence broke out, destroying thousands of men in the Greek armies around the ill-fated walls of Troy, Achilles went to the king and asked him to call upon the priests in order that the Greek people might learn the reason why the Gods had sent the plague among them. The priest informed the king that the pestilence was sent by the Gods as a token of their displeasure against the Greeks because a young woman, the daughter of a priest of Appollo, was held as a captive by the king who had refused to give her up to her father, and to prevent the further spread of the plague, and stay its ravages they were commanded to return the captive girl to her father with an apology and suitable presents, to offer sacrifice of sheep and oxen to appease the wrath of their God Appollo, which we are informed they at once proceeded to do.

So long as men believed that small-pox, typhoid fever, scarlet fever, diphtheria and kindred diseases were sent upon them by the Gods as a mark of their displeasure, or for other reasons, it would of necessity follo

that they would be slow to look about them to find any natural causes for disease, and this, history shows to have been the fact. Of a truth it required more courage than the average man possessed to lay aside the generally accepted belief, and advance, or even search for, other causes. But happily for us who live now such times have passed, never to return. We today stand on a higher plane of intellectual liberty than man ever occupied before. Our conception of God and his universe is grander and nobler than any conception dreamed of by ancient Greek or Roman. Our investigators can now go out in the broad light of the mid-day sun, before the face of all the people and turn over the leaves of the great book of nature. God's own book, written by Himself and published by the author, search for and find out its secrets, and give to the world their discoveries, without fear of death, imprisonment or persecution. Human civilization may for a time retrogade, but it never travels a second time over the same path. When men learned that the top of Mount Olympus was only the home of the storm and rocky waste, and not the abode of the Gods, the divinities whom they had believed for ages made that mountain top their home vanished with the mistaken idea men had held of the mountain peak, vanished, and vanished for ever. Never again will men people the summit of Mount Olympus with its divinities. So with the cause of disease, it has been removed from the domain of the supernatural where it was so long thought to belong and placed upon the list of those things produced by natural causes, governed by nature's fixed and never varying laws. Man will never go back to the old idea, never again can he believe that charms and amulets can prevent or cure disease, never again will he believe that the sacrificing of sheep and oxen has the power to stay the ravages of the plague. As the world has learned that its belief in the Olympian Gods and their mountain abode was false, so has it learned that the long prevailing and old belief as to the cause of disease was a mistake.

The microscope has revealed to us a new world of life and great activity, a world of infinitesimally small living organisms which we sometimes call germs or bacteria. A world sometimes dreamed of by the ancients, but one they were not permitted to discover. A world of organisms that exist in countless myriads with their species, orders, families, and varieties as persistent and well defined as in the higher orders of life. Governed by the same laws, acted upon and modified by their surroundings in the same way. These simple organisms composed of a single cell and so small that we can only see them by the aid of a powerful microscope, perform a great and varied work, they are the universal scavingers of the world, they take possession of all dead vegetable and animal matter, they tear it to pieces, be it animal or vegetable, they decompose it, they pull its elements asunder and deliver them up to the great laboratory of nature to be used again for new beings, new plants and animals. A French writer says of them as follows: "They are the important, almost the only agents of universal hygiene. They clear away more quickly than the dogs of Constantinople or the wild beasts of the desert, the remains of all that has had life; they protect the living against the dead, they do more, if there are still living beings, if since the hundreds of centuries the world has been inhabited life continues, we owe it to them, without them the surface of the earth would be covered with dead organic matter, the remains of plant and animal bodies, which, retaining the elements necessary for the building up of new plant life and animal bodies, would soon cut off the food supply of new plants and animals. Life would be impossible, because the work of death

would be incomplete." Because, as Pasteur says: "The return to the atmosphere and the mineral kingdom of all that which has ceased to live would be totally suspended." As my knowledge of these small microscopic organisms increases, so does my respect for them grow. We owe them much even if some of them do bring disease upon us. We owe it to them that we live; we owe it to them that so much is green and beautiful on our earth. As in the visible plant world by far the larger number are in some way necessary and useful to man and the other higher animals, and a few only are deliterious or poisonous to them. So in the bacterial world only a very few of all the many kinds are injurious to animal or plant life. Only a few can subsist on and destroy living organisms. On the other hand, those that are useful are very numerous and are found everywhere. Among those germs that live and flourish in living organisms has been found the cause of contagious diseases, such as small-pox, consumption, scarlet fever, diphtheria, measles, and the like. We have also learned that supuration, putrefaction and decomposition can only be produced in the presence of some one or other of these bacteria.

Since the discovery was made of the part played by living germs in these different processes, our advancement in sanitary and medical science has been very rapid, our power to prevent and cure disease has been largely increased, and the advancement of sanitary and medical science directly attributable to this valuable discovery has been greater during the past thirty years than during the thousand years previous to that time.

The knowledge we now possess of these disease-producing germs, which are designated by the name of pathogenic germs, to distinguish them from the non-disease-producing ones, was not attained in a month or a year, or by accident, but after more than two centuries of hard and painstaking labor on the part of the best minds of the times, during which time many theories were advanced as to the origin of these microbes and the part played by them in nature's laboratory. It was for a time held by some that these low forms of life were often spontaneously generated, or that new forms frequently came into existence. Many very eminent men took an active part in this discussion, among them we find such names as Tyndal. Pasteur and others equally famous.

It was finally proven that bacteria are under the same law of reproduction as the higher forms of life and that each microbe is the offspring of a parent microbe similar to itself. Among the first to advance the theory that many diseases were caused by extremely small organisms entering the body was Athanasius Kircher, of Germany, about 1670. His belief was that these small organisms belonged to the animal kingdom. They are now classed with plants. In 1671, Lange, of Leipzig, published it as his opinion that puerperal fever, measles, scarlet fever, and other contagious diseases were caused by what Kircher had called animalculæ, and he made considerable advancement in the study of these microscopical germs. His discoveries are looked upon as quite remarkable when the inferior instruments at his disposal are taken into consideration. The best microscope at that time magnifying only thirty-two diameters. His new theory was not accepted, but laughed at and ridiculed.

Van Leeuwenhoek, a Hollander, about 1675, took up the study of these minute organisms, and with a somewhat improved microscope made many valuable discoveries. He was the first one to accurately describe many of the bacteria as we now know them, that is, as to their shape, size and general appearance.

After the discoveries made by Leeuwenhoek, many intelligent physicians began to believe that these minute germs described by Leeuwenhoek were in some way the cause of disease, and began the use of medical treatment having in view the destruction of such germs. About 1726 the general public began to laugh at and ridicule the idea that living germs were a cause of disease, and a book about this time was published in France burlesquing the new theory. This had the effect of bringing it into disrepute, and for a time the germ theory of disease was abandoned, it was laughed out; and the germ theory of disease was not heard of again until Lineus took it up. He declared that the eruptive and acute fevers, also that fermentation and putrefaction, were caused by minute living germs. He was soon followed by Dr. Plenciz, of Vienna, who announced that these microscopic germs had a specific character, that is, that for scarlet fever there was a scarlet fever germ, which in no case would ever produce small pox or any other contagious disease. After this time the study of microscopical germs as a cause of disease, fermentation and putrefaction, was taken up by investigators in all parts of the world. Many different theories from time to time were advanced, only to be abandoned on further investigation, and a large mass of evidence relating to the theory was accumulated.

About 1837 the silk growers of France were very much troubled by a mysterious disease which broke out among their silk worms, causing them heavy loss. These diseased worms were carefully examined by Bassi, who found the spores or seeds of a fungus within their bodies, and demonstrated that a kind of yeast fungus was the cause of the disease, and also that it was contagious. This was the first well authenticated case of disease caused by germs in any member of the animal kingdom. After this typhoid fever, cholera and other like diseases were studied with great care, with a view of finding, if possible, the specific germ that caused them. For a long time very little progress was made in this direction. It was found that the bacteria were so numerous and of so many different kinds that it was impossible to study their life history unless they could succeed in isolating single germs and in that way get what we now call pure cultures This Pasteur and others after a time succeeded in doing, and much has been learned of the life and habits of the bacteria, by the study of these pure cultures in the laboratory where the germs of different diseases are grown and cultivated with as much certainty and precision as we cultivate the plants in our gardens. This cultivation of bacteria has lately assumed quite large proportions, and in many places laboratories have been established to furnish pure cultures of certain germs for the use of such factories as require ferments in the production of their goods. Some of them have even found it necessary to keep in their employ a bacteriologist for that purpose. The particular flavor that gives the desired quality to many articles of food, such as butter and cheese, is produced by special germs, and by cultivating these germs in pure cultures and using them in the manufacture of such products, we are enabled to produce the desired quality of the butter or cheese.

These germs, about which so much has been said and in which so much interest is manifested, belong to a class of infinitesimally small organisms to which we give the general name of bacteria. They are classed among plants and believed to belong to the lower order of fungi. They differ in shape, some being round, some oval, some rod shaped, and others spiral. They also differ in color, some being white, some blue, and others red. The color shows plainly when the bacteria exist in masses great enough to be

seen without the aid of the microscope. One of these bacteria is not very commonly met with, the red one, but it has figured to some extent in history. They have grown on pictures and other objects in cathedrals in Europe at different times, and as they formed round, red drops, they were believed to be blood and were looked upon as miraculous. Sometimes these color germs get into a dairy and will give the milk a deep blue color, sometimes it will color the milk red.

In this connection some very interesting experiments have been made with these color bacteria. It is well known that beautiful flowers have been developed and great changes in their color brought about by natural selection from some very common ancestor by horticulturists. A German bacteriologist experimented with color bacteria in the same way. Taking a deep purple forming species, selecting and replanting the lighter colored one at last succeeded in getting bacteria nearly white.

Bacteria are a very simple form of life, being a single cell composed of vegetable albumen and from 1-12000 to 1-25000 of an inch in diameter. They reproduce themselves in two ways, by division and spores. When the conditions are favorable they reproduce themselves by division and this reproduction goes on very rapidly. If the conditions change so that they can no longer flourish, a bright point makes its appearance in each cell, which increases in size until it may be as large or even larger than the parent cell. This is called a spore, and is really a seed.

These seeds will retain their vitality under almost any circumstances, and for an indefinite length of time. They are so very small that they float in the air unseen, rest upon the walls of our houses, on our clothes, in our carpets or anywhere where dust can find a lodgment, ready at any time under favorable conditions to go into the business again of reproducing bacteria, and causing in a susceptible person with whom they come in contact that particular disease produced by the germ to which the seed belongs. These seeds or spores of bacteria follow exactly the same law that the seeds of higher plants do. We are all familiar with the way they act. If we plant the seed, say of wheat, barley or oats, as the case may be, in a suitable soil, with the necessary warmth and moisture, the seed will germinate in a few days, the length of time differing somewhat with different seeds, we call this in the higher plants germination. So with the spores of bacteria, if they gain access into the living body, where the conditions are favorable for their growth, they take up their abode, and in a few days they too germinate, as does the wheat or oats. We find also that the time required for germination differs in different seeds. In the case of disease we call this time the incubation stage of the malady. It is well known that among our ordinary plants we always (if we get a crop at all), get the same as we sow—wheat will always produce wheat, and so with other seeds. In like manner with the bacteria, the seeds of consumption will produce only consumption, and so with the seeds of the other disease germs.

We have seen that the germs of putrefaction and decomposition tear apart dead organic matter, take what they need for their own use, reducing the balance to new compounds. The disease germs act in a similar manner upon living tissues, they do not flourish well on dead organic matter, or in nature outside of the living body. Like other bacteria they thrive and flourish at the expense of the tissues on which they are located. If the conditions are favorable, different germs grow in different ways, and produce each its own kind of chemical compound. These chemical com-

pounds formed in living bodies by bacteria are the cause of disease and are called ptomaines. Our bodies are made up of communities of cells which have become specialized. Each community doing a special work for the good of all, such as nerve cells, liver cells, bone cells, etc., and all inheriting their characteristics from one original parent cell that did all these different kinds of work for itself, in the days before the cells agreed to a division of labor.

But we have a class of cells that seems to have never become specialized, but to retain to a great extent the character of the original cell. These cells are to be found wandering about in all parts of the body, in the tissues, in the blood, everywhere. Their work seems to be to look after the welfare of all the different communities of cells alike, and perform a sort of police duty for them. If any community of cells is injured or attacked by an enemy they hasten in great numbers to the rescue. If in their wanderings, always on the lookout, they meet any foreign microscopical substance, or anything that is injurious to the body, they at once surround it, digest what they can of it, and carry the rest where it can be thrown from the body. Our power to resist disease depends largely on the number and vigor of these special police cells, they are called white blood corpuscles or leucocytes. These cells play a very important part in protecting us from disease germs and making repairs after an injury.

We have two kinds of bacteria that are very numerous, particularly in crowded and ill-ventilated houses where dirt prevails. If they are not watched with great care, they give the surgeon no end of trouble. One of these is in the shape of little balls or micrococci, having a tendency to cling together and form chains, and are called streptococci. The other forms groups like bunches of grapes and are called staphylococci, they are found floating in the air wherever dust is, and on the clothing and even in the mouths of people. These bacteria getting into a wound make all kinds of mischief, reproduce themselves very rapidly, prevent the wound from healing, get into the circulation, bring about what we call blood poisoning and often death, providing the leucocytes are vanquished in the fight.

We have another bacterium that probably destroys more lives than any other, that is the bacterium that causes tuberculosis or consumption; this is a rod shaped germ and is called a bacillus. It was discovered by doctor Robert Koch, in 1882, and since that time has been seen and studied by bacteriologists in all parts of the world. It is very widely distributed, being found in all countries and in every clime. It is more particularly abundant in cities and old, thickly settled places. It grows and thrives in the living bodies of human beings and many of the lower animals. Like other disease-producing germs, it is not known to grow outside of the living body, except under artificial cultivation. Tuberculosis, the disease that this germ produces, like other germ-caused diseases, is contagious, and is transmitted by germs from one person to another and in no other way. The expectoration of a person suffering from tuberculosis, expectorated on the street or other place may dry and be blown about in the wind, and by being inhaled into the lungs of a susceptible person produce tuberculosis.

The bacilli of consumption are found in large numbers in the rooms occupied by those having tuberculosis, or in places they frequent; they are found in the milk of cows that have the disease, and also in the flesh of infected cattle. The knowledge we now possess of this tubercle bacillus has forced us to the belief that the disease is a contagious one and that it

can, be produced in no other way than by these germs, and that while a person may inherit a particular susceptibility to the disease, the disease itself is not inherited as was formerly believed.

That the contagious diseases are produced by living germs, and in no other way, has been abundantly proven. If we have typhoid fever we find upon examination that the typhoid bacillus is always present, and is never found in any other disease. If we have a case of tuberculosis we find the bacillus that produces that special disease; we find it nowhere but in the presence of tuberculosis. Again, if we take germs from any one suffering from any of the contagious diseases, and cultivate them in pure cultures in the laboratory and inoculate a susceptible person with these pure cultures we get the disease in that person, to which the germs belong, and no other. This being true, all the contagious diseases are preventable, including tuberculosis, and had we the necessary facilities, combined with complete knowledge of the subject, such a knowledge as I believe will be arrived at some day, all these diseases could be entirely banished from our earth.

THE GERM THEORY OF DISEASE.

DISCUSSION LED BY HON. FRANK WELLS, PRESIDENT OF THE STATE BOARD OF HEALTH, LANSING.

Among the numerous revelations which science has made to man during this century of achievement none possess the dramatic interest and real value of those disclosed by the microscope.

By its aid many of the mysteries surrounding the processes of nature have been exposed, and we now read as from a book a solution of problems which have puzzled the world for centuries.

It not only shows us life in its lowest and most primitive form, but it shows us how all pervading such life is and the influences it exerts upon the world about us. In the language of a distinguished naturalist it presents to our view a third kingdom, a kingdom of the infinitely small. But though small the inhabitants of this kingdom are performing the work of Titans. The transformations of our earth which are of most interest to us are accomplished by their unaided efforts.

If they strike down the strong and healthy without remorse, they kindly prepare the stricken victims for another life and in this way people its stage with new and continually changing forms. They are nature's artists in the drama of death and resurrection which she is ceaslessly enacting upon our earth.

The term ferment, given to the processes of these artists in the changes wrought by them upon the bodies of plants or animals after life has become extinct, means a gradual return to the great storehouse of nature of the complex elements of which these plants and animals were composed. It could not long escape the attention of investigators in this realm, that if these organisms could wield such a powerful influence upon dead tissue why might they not on living. A noted physician had long before remarked that the causes of contagious diseases would be discovered when the causes of fermentation were. The prophecy proved true, and

almost simultaneously with the discovery that micro-organisms were the active causes of the changes caused by fermentation, came the announcement of the germ theory of disease. Since these, so rapid and varied have discoveries in this field been made that the term Germ Theory of disease is now a misnomer. The fact that contagious diseases result from the action of minute living organisms is no more a theory than is the multiplication table. This so-called theory stands today as firmly intrenched as a science, as does either mathematics or medicine. Each contagious disease has for its cause a germ or parasite which produces its peculiar disease and no other.

"As ye sow so shall ye reap." No farmer can count more certainly upon the corn or wheat he sows producing its kind than can he who sows small-pox, typhoid fever or consumption, count on a harvest of these diseases. The seed which produces tuberculosis is as plainly visible under the microscope as is a grain of wheat by the unaided eye. Planted in human tissue the former germinates, grows and produces its kind in abundance in the same manner as does the latter.

The admirable paper of Dr. Hicks, which we have just listened to, presents facts which must convince any intelligent mind, that the science of contagious diseases rests upon a foundation which can never be shaken. I can add but little to the array of facts which he has presented to sustain this science.

The evidences are strong as "proofs of holy writ." Stronger, for doubts never exist in the minds of those who study these evidences. Epitomized, they are: that, first, the organism supposed to cause any disease must always be present where the disease exists. Second, this organism must be capable of cultivation through successive generations outside the body. Third, an inoculation from any of these generations into a healthy body must produce the specific disease. Fourth, the same organism must be found in the inoculated body. When this round of evidence is shown, as it can be, skepticism cannot exist.

The three principal methods by which disease organisms obtain access to the body are first, contact with persons or substances carrying such organisms; second, by the food or water taken into the body; and third, by the air breathed. Now if we could carefully isolate the first named so that no contaminated person or thing could come in contact with healthy persons and could render free from disease producing organisms the food we eat, the water we drink and the air we breathe, the diseases which are responsible for the untimely death of two-thirds of the human family, would vanish from the face of the earth.

Mr. Wells was followed by Prof. Victor C. Vaughan, M. D., Ph. D., but, as his was an unwritten address and there was no stenographic report of the Convention, Dr. Vaughan's remarks are not printed in this pamphlet proceedings.

SECOND SESSION, THURSDAY, APRIL 5, AT 7:30 P. M.

THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE BOARD OF EDUCATION.

BY HON. B. S. WAITE, MENOMINEE.

The duties and responsibilities of school boards increase as science, as applied to modern civilization, advances. There is no longer a place in the management of schools for the narrow minded or the "penny wise and pound foolish" who could have maintained such position in the immediate past. The march of science as published and applied by modern boards of health has destroyed his place and created a public sentiment that the individual may not, with impunity, disregard.

The functions of the school board heretofore have been limited to the narrow field of hiring teachers and furnishing a place in which to stay; but now the board is not only expected to hire able and competent instructors, but it must see that suitable buildings are erected, and furnished with such appliances as are required by modern ideas, and the buildings and appliances demanded must not be alone adapted to instruction, from the books, but they must be such as will promote and stimulate the growth, both of body and mind, and, given a healthy body and healthy community, it should be considered criminal on the part of any school board to be so remiss in its duty as to be chargeable with either weak bodies or weak minds, or what really amounts to the same thing, the death of those in their charge. The restriction and prevention of communicable diseases is one of the important duties of the guardians of the schools. The school board can assist in this line by sedulously insisting upon the performance of three important duties:

First, The furnishing of intelligent and competent teachers. Not only such as can teach the a b c's, but such as have some conception of the physical requirements of the human organism.

Second, The supplying of proper and adequate appliances for the conduct of the school, and

Third, The establishing and enforcing of sufficient and proper rules and regulations for the government of both teachers and pupils.

Respecting the first obligation, no teacher should be employed, especially in the lower grades, who has not some instruction in the physical sciences, at least so far as they apply to the human organism. A teacher who cannot appreciate the injurious effects which are likely to arise from allowing a cold current of air to strike upon a perspiring and inactive child, should be relegated to that large and useful class of the community, known as the hewers of wood and drawers of water. A teacher who has not sufficient discernment to detect symptons of illness in a child until the ravages of disease have marked it out to the casual passer-by, has no right to occupy a position among those who, above all others, should be discerning and alert.

Reverting to the second duty as enumerated, I take it to be the duty of the school board to build proper school houses and see that they are adequately heated and ventilated, or to perform the next important duty, see

that they are not built at all. Better far that the child should grow up with what education it can get at home, or from the ordinary associations in life, than grow up with body enfeebled and deformed, a prey to every ill that flesh is heir to, and not only that flesh is heir to, but that mind is heir to also; so I take it that to provide for surrounding the child with those appliances which will insure to it, such a physical development as was nature's first purpose, is one of the most important steps in preventing the communication and spread of contagious diseases. If pure air in quantity approximating 2,000 cubic feet per hour is necessary, that amount should be supplied. If pure water and healthful surroundings will prevent those fell diseases which we all so much dread, then pure water and healthful surroundings should be provided at any cost.

Viewed in the light of modern intelligence and information upon this subject, the early school management, in this city, has been remiss. The policy seems to have been to provide a place for the pupils to congregate, without regard for their welfare when so congregated; as a result, there have been expended many thousands of dollars in the construction of rectangular boxes with no ventilation but through the doors and windows, and no heat except from those infernal machines known the world over as box stoves. In these pestilential resorts our children are compelled to pass years of their lives, and when dismissed, in order to change the atmosphere of the crowded room, are compelled to play in the street, as the buildings occupy nearly all the ground it was thought worth while to provide.

There is an ancient saying that "all roads lead to Rome." In a community like our own, and our own is like all others in this regard, if all roads do not lead to the school house there are roads from all directions, and from every home that do, and many and varied are the people who travel over them. The high and low, the rich and the poor, the clean and the unclean; from the alleys and lanes, from the broad thoroughfare; from the home of the rich, surrounded by every convenience and safeguard, and from the hovel of the poor and squalid, all congregate at the public school. The city is like a great net work or spider's web, where all lines terminate at the school house, then how easy it is, if the greatest vigilance is not observed, to contaminate the whole community with any communicable disease which may appear even in the remotest and least observed part of the city. How important it is that the school board should here recognize and do its duty by promulgating and enforcing rules to meet the emergency.

It is not always plain that heroic measures should be adopted, but it is better to err upon the safe side. I take it there should be no hesitancy in closing the school on the appearance of small-pox, diphtheria or scarlet fever among the pupils, and pupils from the infected family or families should be prohibited the school until the danger is passed. And at a time when small-pox is prevalent or in case a general exposure is feared, it is the duty of the school board to require a general vaccination of all pupils attending school. When I say require, I mean make it a *sine qua non* of their attendance until all danger is passed at least. I am aware there is some question as to the legal right to make this rule, but I believe it should be sanctioned by law, and if it is not, then let the board make it so until reversed by a higher tribunal. By the time such reversal could be reached all danger would be over and an epidemic averted.

The school board can do much, but its efforts would be more effective if it were seconded by an intelligent public sentiment, and by the

patrons of the school. The parent is the person who should detect the disease in its incipient stages, and any parent who would send a sick child to school, or one where there is the least fear that it has a contagious disease is guilty of a crime and should be indicted.

The result of such carelessness on the part of the parent has been recently illustrated in this city. A child whom the parent, it would seem, must have known was suffering from the mumps in the early stages of the disease, was allowed to go to school. The child went up and whispered to its teacher that it had the mumps, and thereby exposed the teacher to the disease, which she contracted, and of which, or some complications of the same, she subsequently died. The child was not to blame; the teacher was not at fault; the parent was. The death may or may not be at the parent's door. Let it rest where it belongs. I merely mention this to show how necessary it is that the parents lend their aid to the school board and the other authorities in preventing disease and death.

Under this head I say cleanliness should be enforced, for as I understand the most of the communicable diseases are germ diseases, and the only sure way to prevent the spread of the contagion is to see that the germ is not carried or in any way transported from place to place, upon the person or clothing. No child should be allowed to attend school who is not clean. Such certainly cannot be termed a severe requirement in a land where soap and water are so plentiful. The school-house should be kept clean and all depositories of excreta carefully cleansed and disinfected, and the school board, in its capacity as guardians of the intellectual and physical welfare of so great and important part of the community, is amply justified in insisting that other officers of the municipality attend to their duty and properly purify all infected and unclean localities, for there is safety only in cleanliness, both of surroundings and of the person; and

"E'en from the body's purity, the mind
Receives a secret sympathetic aid."

I assume that it would not be expected that this subject would be viewed from the standpoint of the school board in a scientific or technical light, but rather from that broad field of common sense, backed by a desire to co-operate with the other co-ordinate and more scientific departments, and with a steadfast purpose to act as light is given it, for the common good, recognizing that what is good for the community is good for the schools.

I have not thought to treat this subject from the broad and scientific plane of school sanitation, but rather from the practical standpoint of the school board, with the object of making practical suggestions as to means of preventing the spread of those diseases so destructive to the life of the young. It is plainly the duty of every person to do the very best he can to this end. The babes can take no thought for themselves, which makes the spectacle of neglect on the part of parents and guardians all the more pathetic. It would seem as though there must be a special Divine interposition in their behalf to preserve their lives to the extent which they are preserved.

THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF A CLERGYMAN.

BY REV. FRANK J. MALLETT, RECTOR GRACE EPISCOPAL CHURCH, MENOMINEE.

It has been well and truly said by an American medical journalist, "That centuries ago medicine, law and theology traveled hand in hand, they had a common end, and were interdependent, hence inseparable and found in company on the same road. Since then by some ill wind dissensions grew between the sisters, and a dogmatic distrust has grown up between them, which has destroyed the old-time union and mutual support, and man no longer profits by their existence as he did when they acted in concert."—Unhappily that statement is too true. And yet are there not glimmerings of a brighter and better day?

It seems to me that the members of the State Board of Health of this commonwealth are doing their part to fulfil the prophecy or hope just expressed, by bringing together the educator, the lawyer, the editor, the physician and the clergyman. They seek by full discussion to create a healthy public opinion, and right action in the community, that is fortunate enough to secure their admirable assistance. I say *fortunate*, and I mean it, for may we not truthfully say that we need instruction and advice in Sanitary Science?

The reformer is always met with opposition, and it is a herculean task to arouse men from the lethargy of centuries, people cling yet to that fallacy revived by Pope—"Whatever is, is right." And so you have otherwise good people going about in view of an epidemic, murmuring certain ungodly platitudes about "the will of God," and "visitations of God." This is surely breaking that third commandment, by taking God's name in vain. People seem to throw blame upon their Maker so glibly, instead of censuring Providence it would be wiser and truer to say that men have often been swept away by the neglect and disobedience of the laws of nature. It is painful to contemplate the cold, hard facts set forth by the State Board of Health "that the diseases that cause the most deaths among us," could be *prevented* largely, by careful adhesion to the principles of sanitary law. "Fate," says R. W. Emerson, "is unpenetrated causes, the water, drowns ship and sailor, like a grain of dust, but learn to swim, trim your bark, and the wave which drowned it, will be cloven by it." Men once cowered before the lightning's flash, dreading the wrath of the gods, but today we harness the mighty force of electricity to the car, or sit in the parlor, where with perfect safety and comfort we may read by its brilliant rays the news from the other side of the earth, flashed across continents and seas, by the same wonderful force. In past ages, men stood horror stricken and helpless in the presence of plagues and pestilence, and conceived the magic incantations, and exorcisings would overcome and destroy disease, and avert death. But all that is smiled at today. And in its place we have enlightened scientific methods, that have achieved most beneficial results and the end is not yet. It is not within the province of this paper to dwell specifically on the five dread diseases that yearly claim so many victims in the State of Michigan, but I pass on to observe that from the standpoint of the priest, or minister this loss of life is appalling.

In "The Book," as Scott called the Bible, we read, "With long life will I satisfy him (man) and show him my salvation." To those who forget not the law of God are promised "length of days, long life and peace." It should ever be remembered that the head of the church, when on earth, restored the shattered strings of our humanity. HIS TOUCH WAS HEALING. He treated disease as man's enemy (Dis-ease = negation of ease), and left the sufferers in possession of that best of blessings, good health. We must feel the same way, striving to have for rich and poor "the sound mind in the sound body," in view of the fact that men do not live out half the number of their days. We also of the clergy must enforce the sacredness of human life. It is ours to lovingly urge men to be loyal to *themselves*. "Thou shalt love thy neighbor as *thyself*."

How few really know and obey the laws of the body. Of what avail is it that our working fellow citizens have obtained better wages, better food, prettier houses, and shorter hours, if from time to time the subtle enemy of disease steals across the threshold, and snatches the rosebuds from the lips, or dims the sparkling light of the roguish eye of the angel of the hearthstone? By everything sacred let men be taught the sanctity of human life, that the divine mechanism, so beautiful, so complex, yet so marvellously adapted to its ends, must be watched, cherished, studied, this humanity sanctified by the incarnation is not yours to neglect or abuse. "Ye are not your own" is eternally true even in this lower sense.

My first thought then is this, that to restrict and prevent communicable diseases, the watchword must be Agitate! Agitate! Educate! Educate! Long before George Eliot set forth the doctrine of "Meliorism," Christianity had emphatically declared it, more fully her doctrine, (a sensible one), being this, that "there may be a positive increase of good and the continual lessening of evil," the only difference between her doctrine and that of the church being seen in the changing of that word may to shall. "There *shall* be a positive increase of good." With that as a foundation for our feet, with the knowledge of this increase of sanitary good going on today in our State, let us push forward, taking pains that no man, or set of men, no nationality, be left in ignorance of the laws of God and man on this subject. In different languages let men read these rules and laws, and words of advice. Let the pulpit be heard enforcing the laws of health, purity and obedience to the civil authority, and although "Cleanliness is next to Godliness," be not found in the Bible. Another good text is namely:

"Godliness is profitable unto all things, having the promise of the life that now is, and of that which is to come." We must interpret that word cleanliness in a broad sense in regard to sanitary matters. It may mean not only personal habits of cleanliness but social cleanliness, clean yards, wholesome drainage, good plumbing, a pure water-supply, a proper disposal of waste and garbage, etc. And in relation to the communicable diseases that are not propagated by decomposing organic matter or garbage, we must reiterate the word of warning "Be clean." But it is one thing to *raise* an alarm, and another to get people themselves alarmed. It does not take a man long to get out of a house if the thrilling cry "fire" sounds in his ears, but how slowly does the idea penetrate the public mind that there is fearful danger in occupying rooms previously tenanted by consumptive persons. Here is a hint to the boarding house and hotel men. With a limited, work-a-day knowledge of bacteriology, and the propagation of disease germs any man may do much to restrict and prevent consumption, diphtheria,

pneumonia, typhoid fever or scarlet fever. *He may do it by simple decency.* Politeness restrains the gentleman from promiscuous expectoration anywhere and everywhere, but sanitary law says that disease-germs are scattered broadcast through the indulgence of this one vicious and vulgar habit. Surely he who would do to others as he would be done by should cultivate this personal cleanliness and so help restrict the dread disease consumption, and other diseases, that are propagated from the mouth, especially in the incipient stage of those diseases, and here we would *attack that mawkish sentimentality that is found often in the community* affected with a contagious disease. There is an utter disregard of personal and general safety, people crowd into the germ-laden room, perhaps there is little need of assistance, and yet the crowd push on.

One of the causes of this recklessness of exposure derives its strength from *social customs.* Customs if bad must be *changed*, whether religious, political or social. If the sick need attention, they will get it. The physician does not study his personal safety so much as that of his other patients and the public. The noble-minded sister or deaconess, or nurse, will bravely face the danger, and faithfully watch and tend the worst sickness. The heroic spirit is not *dead*; the age of chivalry is now, today. Unchronicled and unheralded, the doctor, the nurse and the representative of the church, stand ready to minister each in his "own vocation and ministry," but the real self-sacrifice of a citizen comes in just at this point. Because somebody may say, "You are afraid to go and offer your services," or "You take care of No. 1," is the citizen to be ignorantly forced by fear of social criticism into that course that is stamped with selfishness? All good earthly laws are based on the higher laws of Almighty God, and do echo the voice of Him who said, "The Son of Man is not come to *destroy men's lives*, but to save them." I beg you to note that it is well to remember that sometimes the best thing to do is to *do nothing.* "He also serves who stands and waits."

The attractive thing about our Lord throughout His wonderful life was his constant anxiety about the welfare of others. Go ye and do likewise. It is a personal thing; civilization, progress, what are these? but questions of personal, individual improvement. And *we* think that if society is to exist, to say nothing of its salvation, we must not try to patch up humanity, but *regenerate* it. Science can do much, very much, to help and bless men. Medical science and sanitation are doing much to make life for the masses of men more worth living. The Christian religion does not white-wash, or decorate the *surface* of the man; does not reform his habits merely, but revolutionizes the interiors, making all things new. Most truly has one said: "To surround spiritual captives with statues and pictures, to offer "Them-that-are-bound" a higher wage, or a cleaner street is solemn trifling; it is a cleaner *soul* they want." Get the cleaner soul and you will have the cleaner *body, the purer environment,* says Herbert Spencer, "by no political alchemy can you get golden conduct out of leaden instincts."

The church believes more and more in the lesser gospel of better laws, sanitary, social, and economic; but only in Christianity is there the spiritual forces that can regenerate the race—the community, the individual. We repudiate the charge that Christianity is alone "other worldliness," and claim that a man is a better earthly citizen if conscious of his citizenship in heaven. Modern intelligence should no longer tolerate that

old heresy that would sharply divide a man's every-day life from his religious life. We hear too much about "things secular" and "things sacred," there is but one true, real life, and that is a life of good thoughts and good deeds.

In conclusion, let us endeavor to carry out, in a practical way, the advice and information given us in this convention by those who have made the laws of sanitation their special study. We are in danger of falling into the error of our progenitors who would "hear with one ear, and lose the thing with the other." It is said in an old german poem, that St. Anthony once preached to the fishes; he urged the pickerel not to eat each other, he exhorted the trout not to steal each other's food, he begged the eel not to go *eeling* around promiscuously, working mischief. And the legend adds that, unlike some modern hearers of higher intelligence, the hearers (fishes) were enraptured, but alas they *changed not*, for

The trout went on stealing,
The eels went on eeling,
Much delighted were they,
But preferred the old way.

THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE HEALTH OFFICER.

BY H. L ROSENBERRY, M. D., HEALTH OFFICER OF MENOMINEE.

Few people in our city realize the necessity of the work the board of health should accomplish in a city of 14,000 people. Most people labor under the impression that their duty is to keep the town clear of garbage and other obvious nuisances, while as a matter of fact the local board is only subordinate to the State Board so well represented here today, and the most practical part of its work consists in restriction and prevention of dangerous communicable diseases. It is unfortunate that people in general do not realize this most important element of the work and render willingly such aid as lies in their power.

The population of Menominee is 14,000, and the deaths last year were 217 or 15.5 per thousand per annum. Of these 217

14 or	6.4	per cent	died	of	diphtheria,
13 "	5.9	"	"	"	"	consumption,
11 "	5.7	"	"	"	"	scarlet fever,
6 "	2.7+	"	"	"	"	typhoid fever.
3 "	——	"	"	"	"	————.

Our mortality was below the general average for Michigan in consumption and typhoid fever—yet when we contemplate that these 44 people should have been prevented from having the diseases, which caused their death, it seems to be a frightful waste of life.

Consider for a moment that these 44 people who have died of preventable diseases, if worth as much as an ordinary slave in the 50's, has caused an actual monetary loss to the city of $35,200. This does not include the amount expended for the additional cases propagated from them. This is not a pleasing aspect of the question, counting lives by dollars, but as sanitarians and economists, we are compelled to face the problem, no matter how repulsive it may be. I hope this matter may be taken home to each

one of you that you will in the future exercise more care in cases of dangerous communicable disease.

Allow me to call your attention to what has been accomplished during the past eleven months, owing to a new interest in public health matters. The city council passed a good rigid health ordinance, which has assisted very materially in the work. Public funerals have been strictly forbidden in scarlet fever, diphtheria and small-pox; a more rigid care of the infected has been enforced. The council has also generously furnished all books and blanks needed in the discharge of my duties and have aided me in advice and in their official capacities in the enforcement of these rules. They have been much more awake to our needs than any previous council. Nuisances in the way of filth, garbage, rubbish and bad water have received considerable attention. Over 1,000 nuisances have been brought to my notice during the eleven months of my service. So far as time and money would permit nuisances have been abated. I would recommend to this city the adoption of methods carried out in larger cities, viz.: the collection by the city of all garbage and ashes by a city official under contract for a year.

A move was started by the city in the fall of 1893 which was commendable in my opinion, viz., a house to house inspection. Many places were found to be in an extremely filthy condition and notices sent. The importance of this work cannot be overestimated.

Records are now kept in a bound volume of each and every case of nuisance reported, birth and death records; also a record of contagious diseases. Records are now made of the dates of "taken sick" and "recovery," with the age, sex and name, and name of attending physician.

Since May 1, 1893, there have been reported:

Diphtheria,	88	cases,	with	8	deaths.
Scarlet Fever,	84	"	"	8	"
Measles,	5	"	"	0	"
Typhoid fever,	38	"	"	5	"
Small-pox,	6	"	"	3	"

These 221 cases have caused a considerable loss to the community, to say nothing of the grief entailed by the 47 deaths which have occurred.

Supposing each one of these 221 cases has cost, on an average, $50, a very low estimate when we consider the additional help required, the drug and doctors' bills; the loss of time by the wage earners of their respective families, the aggregate loss from illness will amount to $11,100. Added to this the computed value of 47 lives at $500 each, we have suffered a monetary loss of $23,500, or a total from sickness and death of $34,600.

Each one of these cases has been carefully watched, the instructive pamphlets of the State Board of Health have been liberally distributed, the houses fumigated on recovery.

When a case is reported a record is made, the house placarded, circulars distributed, the schools notified, isolation ordered, and, in the event of death or recovery, the places are fumigated and disinfection ordered, and a certificate issued returning them to their respective schools. This matter seems possessed of a considerable red tape, but no one has devised a better way when patients are scattered all over the city.

We have had, as you are all aware, seven cases of small-pox in our city. The first one came from the Fort Howard sanitarium and was not reported. She had varioloid. She was the direct cause of the development of four cases, and two others contracted the disease from her in a secondary manner. It did not spread outside of these families because they were strictly quarantined.

It seems to me that there is a useful lesson in this series of cases that this municipality should profit by. It would pay the city in dollars and cents to have a city isolation hospital where everyone ill from a contagious disease might be sent free of charge and kept until danger of contagion has passed.

Our present condition might be improved by employing more care by the physicians in reporting the cases recovered, some cases are reported recovered at the end of 5 to 15 days, but an inflexible rule should be adopted by our board to fix the period for diphtheria at four weeks and of scarlet fever and small-pox at six weeks.

Another matter should receive attention during the coming year—that a placard should constitute an absolute quarantine, and in families of the poor the bread winners might be given a pass as is done in Detroit. If it is necessary there it is just as necessary here.

There is no penalty fixed for anyone going into placarded houses when the placard is not accompanied by a quarantine notice, and it frequently happens that in this way persons are known to keep up friendly visits during an entire illness of scarlet fever or diphtheria. There seems to be no redress in the law for such an offense.

Another fruitful field for the health officer lies in the direction of prevention of summer diarrhœa and cholera infantum. Circulars should be issued to the public instructing them how to care for the children of tender age and the sort of food proper for them. A step has been made in this direction by passing an ordinance regulating and restraining the sale of milk within our city. This is however only a stepping stone to much more useful work to be accomplished. No matter how pure milk may be delivered to these people if they do not care for it properly it will soon become contaminated. The blame does not always lie with the milkmen.

The work of the future will increase each year as the city gets larger and a better sanitary condition obtains, and I would recommend to the Board of Health:

1. The appropriation of a sum of money sufficient to make it an object for some one to devote their entire time and attention to it, and even then it is more than any one man can hope to accomplish. The lack of funds has been the cause of not instituting a strict quarantine in more cases during the past year. The city so far has not seen the necessity for such action, except during the time covered by the existence of small-pox in our midst. Yet diphtheria and scarlet fever are much more dangerous diseases than small-pox, as is shown for the week ending February 17, 1894, in New York City.

CONTAGIOUS DISEASES—WEEKLY STATEMENT.—*Report of Cases and Deaths from Contagious Diseases reported to the Sanitary Bureau, Health Department, for the week ending February 17, 1894:*

	Cases.	Deaths.
Typhus fever	0	0
Typhoid fever	2	4
Scarlet fever	153	19
Cerebro-spinal meningitis	2	5
Measles	325	27
Diphtheria	151	47
Small-pox	23	5
Cholera	0	0
Varicella	0	0
Pertussis	0	0
Erysipelas	0	0
Leprosy	0	0

2. Our sewer system should receive constant attention. Our sewers will gradually fill up, and the $100,000 expended in this line will be worse than useless if our sewer system is not kept in good working order. A well organized effort should be made to have all property along sewer lines connect with the city system.

3. A frequent house to house inspection is absolutely indispensable in a city where there is so large a portion of the buildings occupied by tenants. Under the new police ordinance, the duty devolves upon the police force. Private citizens should take this matter in hand and report all nuisances to the proper officer, and see that all nuisances are abated at once.

4. A thorough system of garbage removal is much needed. Many persons have no place for refuse or garbage, neither are they able to have it carted away.

I do not believe I am extravagant in my estimate when I say that 50% of our illness from contagious diseases may be prevented within two years from date. I trust that for your own good you may act upon these suggestions. I thank you for your attention so kindly bestowed.

THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF A LAWYER.

BY B. J. BROWN, PROSECUTING ATTORNEY, MENOMINEE.

The interesting remarks by Mr. B. J. Brown were not in manuscript; and, as there was no stenographic report of the proceedings, the remarks are not printed in this pamphlet.

THE RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE PRESS.

BY H. O. FIFIELD, EDITOR OF THE MENOMINEE HERALD.

LADIES AND GENTLEMEN:—I should have considerable modesty in addressing so august a body as the State Board of Health, sustained by the local committee, at any time and under any circumstances, but more particularly because I have been tacked on by the committee in charge at a late hour as a substitute. Circumstances have, unfortunately, prevented the appearance of Mr. James Russell, the able editor of the Marquette Journal, to whom was assigned the task of reading a paper upon this subject, and I am sure his loss to appear is not your gain.

From time to time the press sends out such timely warnings under appropriate headlines as follows: "Clean Up the Back Alley!" "Is the Cellar Clean?" "Fresh Air Needed!" "School Sanitation Necessary!" etc. I am aware in the average reader's mind there lurks a suspicion that such items are introduced to fill the long felt want of the printer fiend for copy; but I can assure you that this is not always the case.

The issues of life and death are undoubtedly in the hands of God and the doctors; but we are all aware that pure air is necessary, and the purer that air the better. The sense of sight is undoubtedly one source of knowledge as regards health, for if we can see in the back-yard decaying

vegetables, rotten leaves, etc., we may be sure that the air is polluted and reform is necessary, but above and beyond all other safeguards, I would put the sense of smell, for when the nose informs you something is wrong, investigation becomes imperative. The back-yard is the chief source of the editor's attacks, and there are few back-yards that would pass an examination for cleanliness and purity at this time of the year.

All during the cold days of the winter it was very convenient for Mary, Annie or Bridget to open the kitchen door and throw the greasy dishwater or similar liquid refuse out into the snow. It saved the time and trouble and a considerable amount of chilling. Of course they didn't know they were planting the seeds of disease, but they were to a verity, and when the "vernal showers awake a rich perfume," it is the duty of every householder to go forth armed with rake and shovel or the money to pay a man, to remove all such refuse to a place so distant from human habitation it can do no harm, and scatter the healthful disinfectant in its place. Lime is good, carbolic acid better, but the cleaning must come first. City boards of health should make a careful inspection and compel all negligent persons to take these simple sanitary measures. If they do not, some of them will have a "mysterious visitation of providence," in the shape of typhoid fever and diphtheria, and will wonder why "God has afflicted" them, but the doctor will not wonder, nor will their more sensible neighbors. Danger that is not perceived by the eyes or ears is commonly unheeded. People who would flee from a runaway horse, even though no actual danger existed, will permit disease-breeding filth to remain until it becomes a deadly menace to the entire neighborhood. From an editorial standpoint the cellar is also a chief source of danger. Warner tells us that the chimney rests upon a substruction of stone, the substruction rests upon the cellar, and what supports the cellar he does not know, but the cellar supports the family. And after a winter of furnace fires, barrels of potatoes, cabbage, onions and other vegetable secretion, the cellar is apt to get foul. Mothers who keep the upper portion of the house so carefully clean are often unpleasantly reminded of neglect of duty by reading in the paper that if more attention were paid the sanitary condition of the cellar there would be less sore throats, diphtheria, etc. It behooves every housekeeper to see that the cellar is kept with as scrupulous care as the drawing room, but the editor who insists upon this in his daily, is quite liable to incur the frowns of the fair sex. Still, I must reiterate a well-ventilated and wholesome cellar is a matter of the first importance, yet is generally the last thing considered. Death often comes on this underground railway, for it is just those places that may affect the air of the whole house. The plumbing and drainage of the dwelling in the basement are of the greatest importance, and bad air in the cellar may cause unpleasant throat trouble that will baffle even the skill of our good Menominee physicians.

Fresh air and plenty of it is also needed, so that the well posted editor does not neglect to insert from time to time friendly warnings in regard to lack of ventilation in private or public buildings, hoping of course that a word to the wise will be sufficient.

And last and perhaps the greatest of all means toward the prevention or the spread of epidemics is an efficient board of health, for they can move with authority and can compel citizens to adopt sanitary measures when the homely talks of the editor upon this homely subject might fail. It rests with such a board to cleanse the city from home pollution, to protect

them from bad drinking water, to warn them of danger and to shut off disease from contaminating the public. Residents themselves should coöperate with such a board in every possible way, and should notify them of any suspected danger, for in this respect most emphatically, "an ounce of prevention is worth a pound of cure."

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE STATE BOARD OF HEALTH.

BY HENRY B. BAKER, M. D., SECRETARY OF THE MICHIGAN STATE BOARD OF HEALTH.

From the standpoint of the State Board of Health the most important dangerous communicable diseases, named in the order of their importance, are: Consumption, Diphtheria, Typhoid fever, Scarlet fever, Whooping-cough, Measles, Small-pox. I have here a diagram*, copies of which you will find on the last page of the leaflets on the "Restriction and Prevention of Consumption," distributed here. (Referring to a large diagram.) By this diagram, which is accurately drawn to scale, you will see the relative importance of these diseases. All of these diseases are important, but on this occasion I propose to devote most attention to the most important one among them—consumption, because it causes more deaths than does any other disease. How we propose to deal with consumption can be best understood after an explanation of methods by which other diseases have been successfully dealt with; therefore I shall give you a short history of what has been done for the restriction of scarlet fever, small-pox, and typhoid fever.

A little over twenty years ago the State Board of Health began to teach the people of Michigan that scarlet fever is a dangerous communicable disease, that it ought to be restricted, and the Board pointed out just how it might be restricted. At that time there was, to be overcome, not only the opposition of the people generally, through their disposition to avoid a change from the customs built up through many years experience, but the State Board met with the opposition of some of the medical profession, one prominent physician in Detroit attacking in the daily papers the work which the State Board of Health had begun for the restriction of scarlet fever. However, the State Board persisted in such teaching of the people, and it did this by a method which I wish to describe to you, because, so far as I know, the method has been made use of, for the restriction of diseases, more completely and with better success in Michigan than in any other State or country, and the method is applicable for the restriction of many diseases, including that most important disease which now causes more deaths than any other, namely, consumption. The essentials of the method are, briefly, as follows:

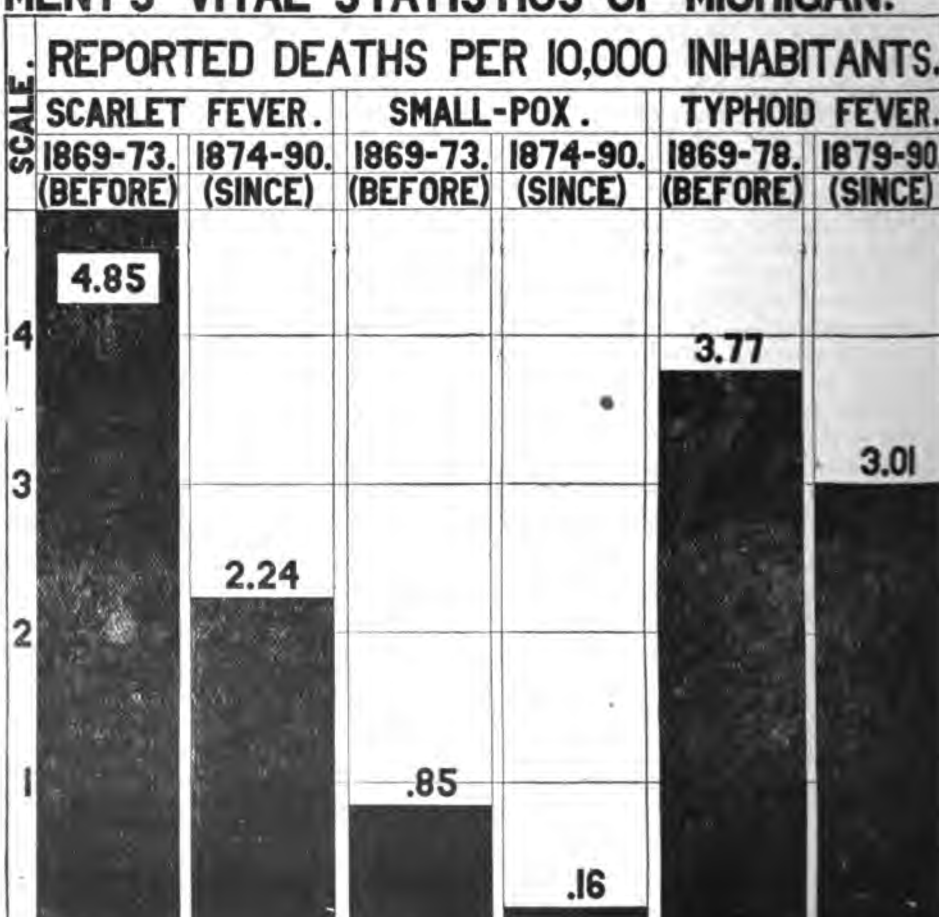
1. Notice to the local health authorities is required to be made by the physician who is called to treat a case of the disease, also by the householder, in case the physician neglects the duty.

2. Prompt report by the local health officer to the Secretary of the State Board of Health.

* The diagram "Deaths in Michigan" will be found printed on the last page of the leaflet "Restriction Prevention of Consumption," issued by this State Board of Health.

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

LIVES SAVED BY PUBLIC-HEALTH WORK. COMPARISON OF DEATH-RATES IN MICHIGAN FROM SCARLET FEVER AND SMALL-POX BEFORE AND SINCE THE STATE BOARD OF HEALTH WAS ESTABLISHED AND FROM TYPHOID FEVER BEFORE AND SINCE ITS RESTRICTION WAS UNDERTAKEN BY THE STATE BOARD. COMPILED FROM STATE DEPARTMENT'S "VITAL STATISTICS" OF MICHIGAN.



LIVES SAVED FROM: SCARLET FEVER (17 YEARS) 7,265; SMALL-POX (17 YEARS) [illegible]; TYPHOID FEVER (12 YEARS) [illegible].

3. Prompt response by the Secretary of the State Board, supplying the local health officer with copies of a leaflet or pamphlet, telling just how to restrict the disease, with request that the local health officer cause the pamphlets to be distributed to the *neighbors* of *the premises* placarded for that disease.

The results of this method of action are very interesting. Some years ago I concluded that the action had been in operation long enough for its results to begin to show, in the mortality statistics collected and published by the Secretary of State; so I compiled a table of the mortality in Michigan by years before, and by years since that method of action was adopted. This table showed that a very considerable reduction in the mortality had occurred during the years the distribution of pamphlets by the State Board of Health had been in operation. At the meeting of the National Conference of State and Provincial Boards of Health at Toronto, Ontario, in 1886, I had the honor of presenting that evidence of the success which had followed the action in Michigan. A prominent sanitarian who has been the executive officer of one of the oldest State Boards of Health, since its organization, said "That if it was trne that there had been a diminution in disease in Michigan since the organization of the State Board of Health, owing to the distribution of circulars and documents, then there was a new means of prevention."* Well, it was true that there had been such a diminution in scarlet fever. And that diminution has continued, so that, from the time the work began—in 1874—up to the close of the year 1890 the death-rate from scarlet fever in Michigan was less than one-half what it had been previous to the beginning of the work. This is shown by this diagram.† I attribute a very large part of this decrease in the death-rate from scarlet fever to the intelligent coöperation of the people, with physicians and health officers, in the two principal measures which the pamphlets taught to the people—namely isolation and disinfection,—isolation of all infected persons and things, and their complete disinfection before coming in contact with healthy persons.

When the State Board of Health began its work, in 1873, small-pox was not such a rare disease in Michigan as it is now. Now we have none except that which immediately follows its introduction from without the State. Then the people generally knew it was a dangerous communicable disease, but they did not fully appreciate the importance of vaccination; and there was a general lack of organization for the control of all diseases, so that even small-pox was permitted to spread and to remain in the State. At that time there was hardly an organized local board of health in the State, except for brief times during the occurrence of small-pox, and then the organizations and work were very incomplete. Through the efforts of the State Board of Health, the local boards throughout the State were stimulated into systematic organization, every year. A law was passed authorizing local boards to offer free vaccination. General vaccination and revaccination was recommended by the State Board; and a "campaign of education" similar to that which I have outlined, was established and has been maintained. The result is accurately shown in a diagram, copies of which I have had distributed here. You will see that the mortality from small-pox has been reduced so that since the work for its restriction has been in progress the death-rate has been less than one-fifth what it was before,—

* Page 58, Proceedings of Conference at Toronto. 1886.
† The diagram "Lives Saved by Public Health Work" is printed on page 32.

four-fifths of that mortality has disappeared. This means a saving of nearly two thousand (1,921) persons from death by that loathsome disease.

In 1879 the State Board of Health commenced systematic work for the restriction of typhoid fever. That disease is spread through practices and neglects very different from those which permit of the spread of scarlet fever or small-pox. But the method of work, by a central office which exerts its influence throughout the State, is much the same in all the dangerous communicable diseases, the State Board receiving from the local officers notices of the outbreaks, and distributing through the aid of those same local officers the pamphlets of instructions just how to restrict the particular disease which is then present. The result of the efforts are apparent in the diagram, the death-rate having been seventy-six one hundredths of one per year, per ten thousand inhabitants, less since than it was before the inauguration of the work, which is certainly encouraging, because the least progress may be expected in the first years of the effort, and we may reasonably expect the results to increase hereafter. Already, in the twelve years, there is an apparent saving of one thousand six hundred and seventy-one persons from death by typhoid fever. That is to say, under the former death-rate 1,671 persons would have died during the recent years more than have died. It is quite possible that, under the old rate of mortality, some of us now present on this occasion might have been called to our final account.

I wish to call attention to the fact that the method employed by the State Board of Health, does not consist simply in printing pamphlets containing the best that is known on the subject of restricting a given disease, and then distributing copies of that pamphlet indiscriminately. If the distribution were in that manner, most of the pamphlets would undoubtedly go into waste baskets, without having been read. It would be like striking iron when it is cold. The method which the Michigan State Board of Health has employed is like "striking the iron when it is hot," so that an impression may be made, deep and lasting. The pamphlets are distributed to the neighbors of the persons sick with the dangerous disease. Sooner or later that disease occurs in every part of the State; therefore, after a time the people in every locality have had the pamphlets placed in their hands at a time when, because of the known proximity of the dangerous disease, their own household has been threatened. Under such circumstances they are ready to receive the statements put before them by the State Board of Health. The result is that the people throughout this State quite generally now know that scarlet fever is a disease which may be restricted. They are much more ready to coöperate with the health officers for its restriction than they were before that "campaign of education" had been planned and executed. The same is true of several of the dangerous communicable diseases.

The office of the State Board of Health has a force of clerks constantly employed in this "campaign of education" relative to nearly all of the communicable diseases which cause most deaths in Michigan. But, while much can be done relative to any disease which, like scarlet fever or small-pox, is promptly reported, little can be done relative to any disease which, like consumption, is not promptly reported. Relative to such diseases what is done is of that sort which I have likened to striking iron that is cold. The State Board of Health has printed ten editions of its pamphlet on the restriction of scarlet fever. One hundred and forty-six thousand copies have been printed. But of its leaflet on the Restriction of Con-

sumption only two editions, ten thousand copies in all have been printed. To be sure the work on scarlet fever began some years first; but relative to scarlet fever we are distributing about fifteen thousand copies per year, while relative to consumption we cannot find place for more than half of that number. In order to properly carry on the "campaign of education" relative to consumption, we need to know just where each consumptive person is, so that we can send our valuable information where it is needed, and where it will be likely to be read, and to some extent in some instances acted upon.

What I have said will serve to indicate one very important reason why consumption should be promptly reported to the local health authorities, and by the local health officer to the State Board of Health. Then the local officers should place in the hands of the consumptive person, and in the hands of those most likely to be endangered by the consumptive person, and in the hands of those who control the movements and actions of persons liable to spread consumption, plain instructions how to restrict that disease. This is made practicable by the State Board of Health, which supplies leaflets of such iustructions for such purposes. I have distributed here samples of such leaflets, of which I shall be glad to have each person here have a copy.

The leaflet was undergoing preparation during several years; and it is believed to contain very condensed and reliable statements of the leading facts applicable to the restriction and prevention of consumption.

How Consumption is Spread.

The fact that consumption of the lungs has been caused by the accidental and by the experimental inhalation of the bacilli, in animals and in man, put with the fact that the greatest known source of the bacilli is the sputa of consumptives, and with the other fact that consumption of the lungs is the form of tubercular disease which is most common, is not all the evidence which has accumulated tending to prove that tubercular disease is usually spread by what goes out from consumptive lungs, and is usually spread to previously unaffected lungs,—in other words—spread by the inhalation of dust from dried sputa. Thus Dr. C. G. Currier, in a paper before the New York Academy of Medicine says: "Summarizing the observations made in two hundred and twenty-one autopsies of tubercular cases, Grawitz, formerly Virchow's assistant, reported one hundred and fifty-two cases as primary in the lungs, nine as primary in the digestive tract, three arising from external wounds, and, the original entrance of the infection was doubtful in the other cases."*

The evidence is strong that the greatest of all sources of danger is in the sputa of well-developed cases of consumption of the lungs. Therefore, it is of the greatest importance that such cases be reported at once to the local health officer, and by him to the State Board of Health. Fortunately it is in just such cases that the disease can be recognized with certainty. When that condition is reached, the friends of the patient are frequently able to recognize the disease. But the physician has, in the bacilli in the sputa, positive evidence of the presence of the dangerous element. If the attending physician is not sufficiently expert in the use of the microscope; or if he prefers to have such work done by a specialist, there are now those

*"1. Deutsch militaraztl. Zeitschr, 1889, Heft 10, Ref."

in all cities, and in many country villages, who will gladly do such special work for physcians. (In New York City the Board of Health will cause such examinations to be made. The same is true in the city of Detroit.) It is a fact which is extremely encouraging, and leads to the hope that much may be speedily accomplished, that as soon as the disease reaches the stage of greatest danger to the public it is so easily and certainly recognized. If the bacilli are given off in very considerable numbers, they are to be found by the usual methods, with the microscope, by means of stains.

There are other facts which seem to warrant the hope that the restriction of consumption will prove to be easier than the restriction of scarlet fever. The specific cause of scarlet fever seems to be frequently given off from the body in such a form as to immediately become a part of the dust in the clothing, and about the patient. The specific cause of consumption is not often so given off. The exhaled breath does not contain it, except when the breath is coughed out. The location of the specific cause is generally known; it is quite generally associated with a substance which is visible; it may be so treated that it does not readily become a part of the dust in the patient's clothing, or about the patient, or of the dust of rooms occupied by the consumptive person.

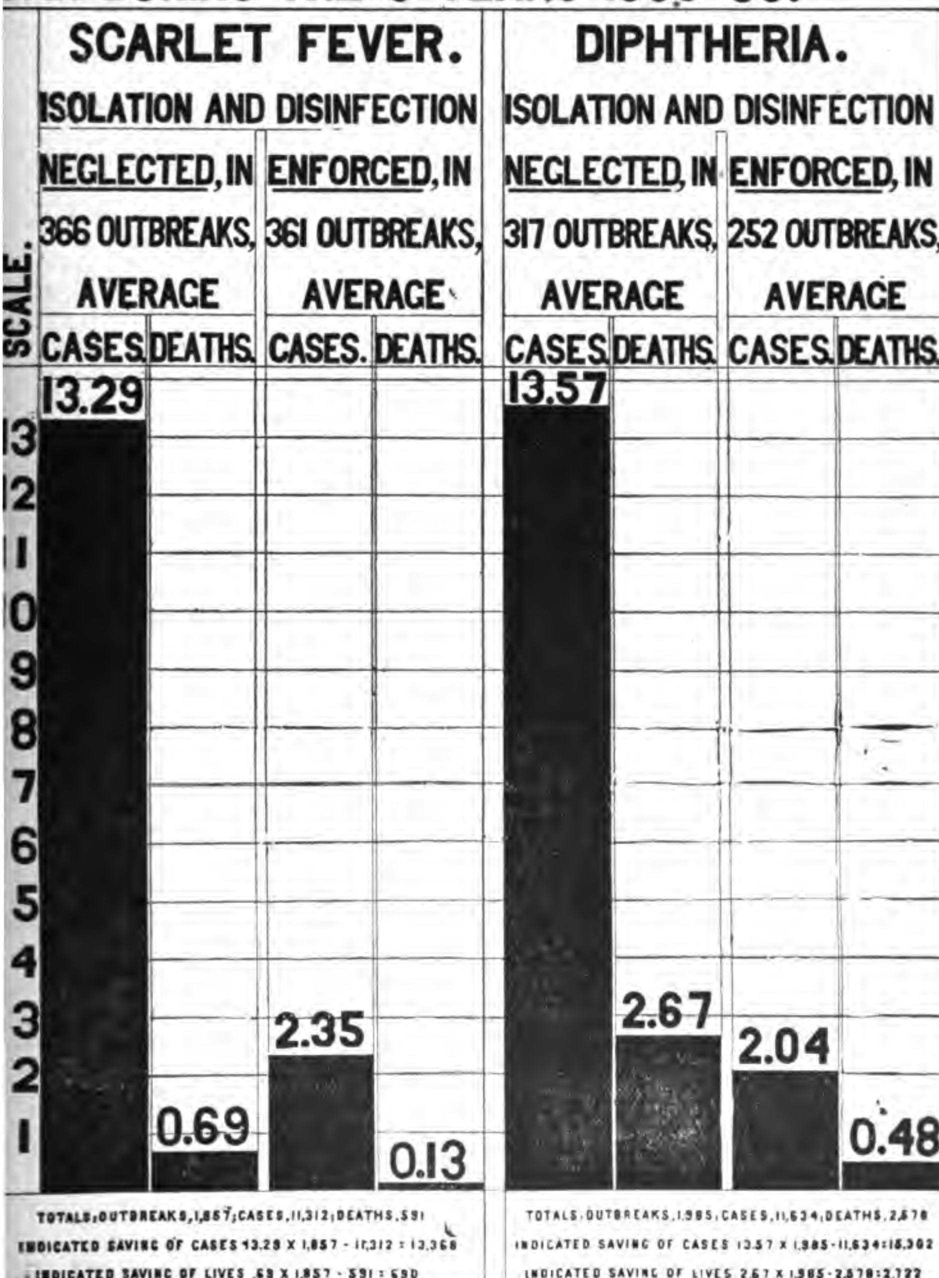
These being the facts, it seems quite possible for a consumptive person to so care for the general safety, that he may move freely in private and in public without danger of spreading the disease. But in order that this may be done, it is essential that the consumptive person have complete knowledge of the methods by which consumption is spread, and by which it is restricted. And this knowledge is not enough; there must be a conscientious determination to perform carefully all those duties required to make sure that the specific cause of the disease is promptly destroyed, and not permitted to endanger the life of another person. If the patient has not that knowledge, is incapable of comprehending it, or, having the knowledge, if he has not also a conscientious regard for the safety of others, the public interests demand that such a person having well-developed consumption of the lungs shall be isolated, for the public welfare, because *he has the most dangerous communicable disease now known to us.* The best place for all such persons is in a special hospital, where ~~under~~ well-planned rules and trained attendants the danger of spreading the disease shall be reduced to the minimum.

It is evident that the idea of isolating consumptives is extremely unpleasant to many people, probably to all, unless through a study of the subject it has come to be realized how great is the price humanity pays for the freedom accorded to consumptives. I believe it is practicable for intelligent, conscientious consumptives to so act as to avoid spreading the disease; and to do this without any great degree of isolation. Relative to the isolation of consumptives, then, the question is restricted to the propriety of enforcing care for the rights of the whole people upon those consumptives who without compulsion are incapable of taking, or unwilling to take, the necessary care to avoid jeopardizing the lives of those who may come within the circle of their infection. For myself, I have no hesitation in expressing the belief that all such consumptives should be isolated. Insane consumptives should be isolated. Consumptives in prisons, poor houses, and reformatories should be isolated.

Compared with ordinary life-saving measures, the restriction of the dangerous communicable diseases is of overshadowing importance. The

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

ISOLATION AND DISINFECTION RESTRICTED SCARLET FEVER AND DIPHTHERIA IN MICHIGAN DURING THE 5 YEARS 1886-90.



United States government has a Life-Saving Service, with its employés on every coast; and its savings of life and treasure are worthy of every such effort. Yet in the aggregate throughout the United States the savings of life and treasure by the National Life-Saving Service, are small compared with what has been demonstrated to be practicable in a single State like Michigan through the restriction of diseases. In Michigan thousands of human lives have been saved from small-pox, diphtheria, typhoid fever, and scarlet fever. It is proposed now to continue that work, and to apply some of the same methods, which have been so successful in these diseases, to the restriction of that disease which now causes the most deaths.

It has been proved in Michigan, again and again, that in outbreaks of diphtheria and scarlet fever where isolation and disinfection are promptly and fully enforced, four-fifths of the cases and deaths from those two diseases are prevented. One of the diagrams* distributed here exhibits the absolute proof of this, in the experience collected during five years. Isolation and disinfection are not always promptly enforced; but, as I have pointed out, the death-rate from scarlet fever throughout the entire State has already been reduced one-half. For the reasons which I have given I believe that consumption is much easier than scarlet fever to restrict and prevent. If we can reduce the death-rate from consumption one-half we shall save the lives of fifteen hundred persons a year, in this one State of Michigan. I believe it can easily be done, and that it is eminently worthy of being done.

Each one of you may be able to aid in this grand work, because, in such work, man is his "brother's keeper."

Dr. C. F. Larson, of Iron Mountain, made a few extemporaneous remarks which were highly appreciated by all present.

THIRD SESSION, FRIDAY, APRIL 6, AT 2:30 P. M.

THE PREVENTION OF CONSUMPTION.

BY H. A. VENNEMA, M. D., MENOMINEE.

The prevention of consumption, the scourge of our fair land today, the dread disease which claims more victims every year than any other disease known to man, killing about one-third of those who perish between the ages of 15 and 45, a disease most insidious in its onset, and often relentless in its course, is a subject to which it is my privilege to call your attention today. When we pause to consider that the disease claims its victims very largely from those in the prime of life, from the ranks of the fairest and best of our land—the young man, his education completed, just about to launch out on life's journey, its fondest ambitions almost within his grasp, is laid low by the fateful finger of consumption; the young girl, just budding into womanhood, is cut down like a flower in the field. Annually thousands and thousands of fathers and mothers are summoned

* The diagram "Isolation and Disinfection Restricted Scarlet Fever and Diphtheria in Michigan during the 5 years 1886-90" is printed on page 37.

to pay tribute to the dread destroyer, and millions of orphans left destitute to fight life's battles alone. I say, when we stop to consider the vast amount of suffering and sorrow, the broken hearts, the blasted ambitions, directly caused by the ravages of consumption, the picture is truly appalling and the situation well worthy of the most earnest and thoughtful consideration, not only of the medical profession, but also of the laity and the general public, on whose coöperation we are so largely dependent for the *restriction* and *prevention* of this terrible disease.

This paper has not been written for the benefit of the doctors, but to give to the people of Menominee some idea as to what can be done in this direction, and that you may more fully appreciate the importance of the preventative measures we are about to recommend, it is pertinent here to give a very brief description of the disease under consideration.

The disease, Phthisis, obtains its name from the Greek word, meaning—I waste away, I decay—which in a general sense means a progressive emaciation of every part of the body; it is generally, however, restricted to phthisis pulmonalis, or consumption of the lungs.

The course and special characteristics of the disease depend very largely on the seat of primary infection, which in a large number of cases is the lung, but may be the larnyx, intestine or lymph glands.

The onset of pulmonary consumption is generally very gradual; almost the first symptoms noticed by the patient are the cough and its attendant expectoration. He may at the same time complain of either a stitch like or a dull pain in the chest or between the shoulder blades, and of a shortness of breath on slight exertion. Besides these symptoms, which point pretty directly to disease of the lungs, the loss of appetite, general weakness, progressive emaciation, a steadily increasing pallor of the skin, fever and night sweats, are all symptoms which follow each other more or less rapidly in the course of the disease. The symptoms gradually increase in severity until life itself becomes a burden, and after weary months of suffering the curtain drops and death closes the scene.

ETIOLOGY.

Now as to the etiology—the causes which produce consumption. We speak of consumption as being hereditary—transmitted from parents to their children. Properly speaking, there is no such thing as hereditary consumption. Since the discovery by Robt. Koch of Berlin in 1881 of the bacillus tuberculosis, it has been conclusively proved that this germ or parasite is always *the active agent* in the production of consumption and that it is never produced without it. A secondary factor in the production of the disease is a tuberculous predisposition or diathesis, which, the facts show in a large number of cases, to be inherited. It is not the disease tuberculosis, which comes into the world with certain individuals or with successive children of the same family, but the aptitude to contract it, should external conditions favor. It is therefore only the susceptibility to the action of the tubercle germ which is hereditary. Just what conditions constitute this turbercular diathesis it is impossible to say but it is probably a certain quality of lung tissues which is favorable to the multiplication of the tubercle bacillus. If the introduction of the parasite to the lungs can be prevented, the disease will not be produced no matter how strong the predisposition. On the other hand, if the predisposition be wanting, the disease will not be produced, no matter how great the expos-

ure to the specific cause. Bearing these facts in mind the indications for the prevention of consumption are perfectly clear.

The germ of consumption, magnified under the microscope, presents the appearance of an exceedingly small rod. It is invisible to the naked eye and probably not more than $\frac{1}{3000}$ or $\frac{1}{4000}$ of an inch in length. It is not probable that the tubercle bacilli multiply outside of the human body, since they can develop only in a constant and uniformly warm temperature of between 85° and 105° F. They are therefore, true parasites which can propagate and multiply only in the bodies of animals. They are exceedingly tenacious of life and seem to preserve their virulence and their ability to multiply, outside of the human body for a very long time, yet they are readily killed by heat, by sunlight and by many of those chemical substances which we call disinfectants. If then, the body becomes infected with tubercle bacilli, they probably always come originally from some other individual, man or beast, with tubercular disease.

By experiments it has been shown that these germs are not exhaled by the *breath* of consumptive patients, but are expectorated in the sputa. Grancher caused a consumptive to breathe two hours a day for many days into an air tight rubber bag containing Guinea pigs and the animals did not contract the disease. On the other hand, animals inoculated with the sputa of consumptives have contracted the disease and died. The expectorated sputum of tuberculous patients, therefore constitutes the most dangerous source of infection. This dries on the floor on our public sidewalks, on the linen and on other objects and then the smallest particles which contain the germs of infection are carried off by the air, to scatter disease wherever the wind blows them. These germs, still virulent and capable of producing the disease in proper soil, have been found in the dust gathered from the walls of rooms in which consumptive patients were confined as late as six months after they had been expectorated with the sputa, showing conclusively their exceedingly great tenacity of life and proving beyond a doubt their dangerous character.

The most common method of infection is probably by inhaling the germs with the inspired air. If the germ finds in the lungs a suitable soil for its development, if the vital resistance has been lowered by disease and indiscretions, consumption is the inevitable result. If, however, no hereditary or acquired predisposition exists, if the vital resistance is up to the standard, no bad effects follow. Another method of infection is the drinking of milk from tuberculous cows. Though in most cases the germs are destroyed by the action of healthy gastric juice, yet this is not always the case, and tuberculous infection of the intestine may be the result.

PREVENTION.

From what has been said it is readily seen that the only effective way to prevent the spread of consumption is to destroy all tuberculous sputa and the germs contained therein, before it becomes dry and a part of the dust we are constantly breathing into our lungs. The conditions, however, under which the world lives today are such that to do this very effectually is an absolute impossibility, so then it becomes our duty to approximate this result as nearly as we can, and while we are trying to annihilate the tubercle germ as soon as it comes within our power, we should not forget the importance of raising the vital resistance of the human body by enjoining a strictly hygienic mode of living.

Of special importance is this to those who come into this world with a hereditary predisposition to tubercular disease. Good hygiene is of vital importance to such an individual from the very beginning of his existence to the evening of life, when its sun is gradually nearing the horizon and the four score years and ten allotted to man are drawing to a close; for, while consumption is most common between the ages of 15 and 35, yet it is not by any means rare prior to this time and in more advanced age. We would therefore surround the infant, born of tubercular parentage with every influence which shall tend to build up a *strong body*. We would have it fed at *stated intervals* and provide for it a good healthy wet nurse or feed it on some form of artificial food, in case good wholesome cow's milk is not well borne. We would see that its little body was kept clean and fresh. Nothing so tends to invigorate the skin and tone up the muscles, as the morning bath, followed by a gentle rubbing of the surface all over the body.

Then after its bath we would place it, scantily clothed in its cradle and allow it to kick and frolic to its heart's content, by way of gymnastics; the child needs this for exercise. Soft and warm flannel clothing next to the skin should invariably be the rule. We would see that the nursery had a thorough airing every day and try to bear in mind that pure fresh air and sunlight, so essential to the life and vigor of a plant, are no less so to the health and development of a little child.

Then, as the child grows older, while we would endeavor to supply the mind with proper food and training, yet we would zealously guard against a mental development at the expense of the physical; for how often do we find a highly developed and cultured mind and a feeble physical constitution associated in the same body, where this unequal development is directly the fault of the individual himself—truly these things ought not so to be. The members of families bearing a hereditary susceptibily to the acquirement of consumption should strive to foster those conditions which favor a healthy vigorous life. It would be well for such individuals in particular to adopt a code of rules for hygienic living, something like the following.

Observe the most rigid regularity in your habits. Keep your feet warm and dry and your body warmly clad; make a point of retiring early at night and of rising with the lark in the morning; keep busy at some wholesome occupation and avoid idleness; don't eat between meals nor late at night; avoid dissipation and excesses of any and every kind; don't become a *slave* to "*society*;" don't permit your inclinations in this direction to get the better of your judgment and don't indulge in any social pleasures which may jeopardize your health; train yourself to walk erect, with shoulders well thrown back, keeping your mouth closed and breathing through your nose, thus permitting the cold air to get warm before it strikes the throat and lungs, perchance to set up an irritation there. Take plenty of outdoor exercise every day; exercise moderately, avoiding undue exertion but exercise systematically, and carefully guard against taking cold, for while colds do not in themselves cause consumption yet by impairing the quality and tone of the lung tissues they often pave the way by establishing a condition favorable to the development of the germ. I am fully convinced in my own mind that if we would but exercise a little more care in our manner of living and not invite disease, as so many do by careless, unsanitary habits, consumption and disease in general would be cheated out of a large percentage of its victims.

Now then, what is our duty with respect to the bacillus tuberculosis? Briefly, to annihilate it before it has an opportunity to annihilate us. In order to successfully carry out our campaign against this vast army of parasites, the following rules have been laid down:

1. Any person who has an habitual cough and raises sputa should have a microscopical examination of the sputa, to ascertain if it contains the germs of consumption.

2. No consumptive should expectorate on the floor or anywhere on the ground, but should for this purpose carry small bits of cloth, each to be used only once and burned at the first opportunity, and before they have become dry.

3. Cuspidors in hotels and all public places as well as in the sick room should be partly filled with water containing five per cent of carbolic acid or some corrosive sublimate as a disinfectant.

4. All dejecta of a consumptive patient should be at once destroyed or disinfected.

5. More attention should be paid to thorough ventilation, especially as to the location of foul air exits which should be at the floor level so that the general direction of the foul air should be downwards and not upwards into the nostrils of persons occupying the room.

6. The broom or feather duster should never be used in a room habitually occupied by a consumptive; and the floor, woodwork and furniture should be wiped with a damp cloth. General house cleaning, sweeping of carpets and brushing of draperies in such a room should be deferred until after the room and contents have been thoroughly fumigated with burning sulphur.

7. The clothing of a consumptive patient should be washed by itself; the same applies to the bedding, and the handkerchiefs should be boiled and thoroughly disinfected at each washing.

8. No one should sleep in the same room with a consumptive, or in a room which has been occupied by a consumptive until after such room has been thoroughly fumigated with burning sulphur.

9. All milk which is not absolutely above suspicion of tubercular taint should be boiled before being used.

10. All meat from tuberculous animals should be destroyed and all meat from unknown sources should be well cooked before being used for food.

The old adage "an ounce of prevention is worth a pound of cure" is certainly applicable here. It is with the deepest gratitude that we as a race should pay our respects to modern scientific research. We little realize until we stop to think, how much we owe to such men as Robt. Koch, Pasteur, and Edward Jenner and how greatly we are indebted to sanitary science as carried out by our State Board of Health. Many years of experience, show that such restrictive measures as they recommend, relative to dangerous and communicable diseases have been the direct means of great reductions in the death rate of these diseases. From scarlet fever for instance the death rate is only one-half what it was before our State Board undertook restrictive measures.

These measures, as they apply to the prevention of consumption are not only intended to protect the unafflicted, but are of vital significance to the consumptive himself, for it frequently happens that the system is able to throw off the disease germs before they have done any serious mischief, or that under certain conditions, a dense enclosing wall or capsule is formed around the affected tubercles in the lung, completely shutting them off

from the rest of the body, thus cutting short the progress of the disease and effecting what is spoken of as a spontaneous cure. It follows therefore that the chances for recovery from consumption are greatly improved if the patient will protect himself against fresh infection from material which he has once got rid of and which should have been destroyed.

But, when the *individual* has done *what he can* in making his surroundings clean and in thus limiting the spread of the tubercle bacillus, there still remains work for municipal and state and national authorities in diffusing the necessary knowledge of the disease and its mode of prevention, among our population at large, and in providing hospitals for the care and isolation of such consumptives as can not properly be cared for at their homes, and while the isolation of consumptives may seem an extreme and barbarous measure, yet when we stop to consider how great the price humanity pays for the freedom accorded to consumptives, we must acknowledge that isolation is both economical and expedient and the only way to effectually restrict the spread of consumption and eventually to stamp out the disease.

It is to reach *the people* that such conventions as these are held. I have seen in our own community unmistakable evidences of skepticism and prejudice against the regulations of our health department, and from people whom I thought were quite intelligent. Is it not time, in view of what has been accomplished and of what we know can be accomplished, by proper sanitary regulations in the prevention of disease, that we were laying aside our antagonism and taking a more active interest in these matters which so vitally affect our welfare. The bacterial origin of disease is no longer a mere theory; we have gone beyond the realm of theory and reached a point where facts, cold facts with undeniable evidences of their genuineness, stare us in the face and *demand our attention.* It therefore becomes the duty of every one personally to endorse and comply with the rules of our health departments and by our coöperation and the influence we may be able to exert among our fellow men, uphold them and aid in this grand work of saving human life.

I trust the day is near at hand when practical sanitary science and the methods of prevention of communicable diseases will be a prominent feature in the instruction provided in our public schools, for as the twig is bent, the tree is inclined. We have good reason to believe that the time is not far distant, when consumption, that dread malady upon which we have been accustomed to look as a family curse, whose victims far outnumber those of all other infectious diseases, sparing neither rich nor poor, "seizing upon life while it is yet only a promise, but most inexorable in the fulness of its tide"—when consumption, and I believe I am not over-sanguine, will be as much under our control as small-pox or any of the other communicable diseases to which the human race is subject, and that eventually it will become as completely stamped out from our midst as leprosy or the black plague have been, both diseases even more terrible in their fatality than consumption.

THE PREVENTION OF CONSUMPTION.

DISCUSSION OF THE SUBJECT LED BY W. R. HICKS, M. D., MENOMINEE.

The discussion on this subject was opened by Dr. Hicks. He was followed by Drs. Redelings, Noer and Salisbury. The remarks by these gentlemen were not in manuscript; and, as there was no stenographic report of the proceedings, the discussion is not here reproduced. Dr. Henry B. Baker, Secretary State Board of Health, also discussed the subject. Dr. Baker's discussion had been prepared in manuscript, and is as follows:

CONSUMPTION.

DISCUSSION BY DR. HENRY B. BAKER, SECRETARY OF THE MICHIGAN STATE BOARD OF HEALTH.

The Specific Cause of Consumption.

The specific cause of consumption is one of the smallest of living things, a plant, which is colorless and nearly invisible until it is stained, and then is visible only by the aid of a powerful microscope, being only one-fifteen thousandth of an inch in length; and its breadth is only about one-sixth of its length. It is important that we hold in our minds a distinct image of this organism, so that we may have that "scientific use of the imagination" which will enable us to see with "our mind's eye," wherever numbers of this species are distributed, this greatest of all causes of deaths.

Where and how does this, our worst enemy, live? It lives within the body of man or some other warm-blooded animal; one reason being that it does not thrive at the ordinary temperature of out-door air; and another is that it needs for its sustenance the fluids and tissues of living animals. How does it get from one living body to another? This is the question the replies to which should supply us with just that knowledge necessary in order to avoid this great destroyer.

How the Parasite Gets from one Living Body to Another.

The victims of this destructive parasite generally soon die, and, with all the parasites they then contain, are buried in the ground; but, before the death of the host, the parasite usually has had abundant opportunities to be scattered so widely that, heretofore, the continuance of the species has been very thoroughly provided for.

There are a number of ways in which this microscopic parasite may come from one body to another; such as through the eating of insufficiently cooked flesh of an animal in which the parasite is, through the use of uncooked milk of such an animal, and through inoculation of the germ through any break in the surface of the body. In rare instances the germ passes from parent to offspring; but heredity is not so important as has been supposed. By far the most important and most common way in which the germ leaves the human body is in the sputa of a person having pulmonary tuberculosis, commonly called consumption of the lungs. That which is coughed up by such a person contains those germs of disease in numbers too great to be counted. So long as this substance remains moist the germs are not likely to be much scattered; about the only

danger then is that they may come in contact with some broken place in the skin, or in some unusual way gain entrance to the body. But unfortunately these germs are not destroyed by drying; and, as soon as they become dry, their smallness and lightness favor their becoming a part of the floating dust in the air, and when this occurs they find ready access to the lungs of whoever comes within the area infected by them. Thus we see just how it is that consumption is an infectious disease. It is a communicable disease. As the law is phrased, it is a "disease dangerous to the public health," because the germs given off in the sputa of one person sick with consumption are liable to be scattered, breathed in, and cause the disease in many other persons. It seems to be proved that the disease is most frequently caused by the germs of the disease entering the nose, throat and lungs with the in-breathed air.

The Restriction and Prevention of Tuberculosis.

Knowing, as we now do, just how tuberculosis is generally spread and just how it is contracted, we are in a position to act intelligently for its restriction and prevention. The most important measure is the immediate disinfection of all consumptive sputa. And since all sputa and all discharges from the nose so frequently contain germs, which are capable of reproduction, and so of spreading some disease, all sputa and all discharges from the nose and throat should be so dealt with as that it shall be at once so isolated that it cannot infect any person or area, and that it shall be destroyed or disinfected as soon as practicable. I have read that for a long time after pocket handkerchiefs were first brought into use, they were properly regarded as unclean and not to be exhibited in polite society, but that a French queen is responsible for their coming to be ornamented and generally exhibited. Undoubtedly the careless shaking out of handkerchiefs that have been once used is not infrequently responsible for the spread of disease; and of diseases which may be thus spread, the list is somewhat long. A sanitary fashion-book should ordain that no handkerchief that has been once used shall be shaken out in the presence of any person, nor where the dust from it may be inhaled by any person. As an illustration of how important this is in the case of consumptive sputa, the instance may be mentioned of a lady who contracted consumption by crumpling up and shaking out the handkerchiefs used by her consumptive husband. She contracted pulmonary consumption, and died. In South Carolina, at a resort for consumptives, I was told by physicians that the negro washerwomen not infrequently contract tubercular disease from washing the handkerchiefs of consumptives.

These two instances illustrate the importance of disinfection of the sputa of every consumptive, before there is opportunity for the germ to become dust, and before the moistened sputum comes in contact with the flesh of any person. The State Board of Health has recommended that "The consumptive should carry small pieces of cloth (each just large enough to properly receive one sputum) and paraffined paper envelopes or wrappers in which the cloth, as soon as once used, may be put and securely enclosed, and, with its envelope, burned on the first opportunity."

Now that we think that we know just how this most important disease can easily be restricted, it has become important to hav e this knowledge reach all the people, and especially those who are in greatest danger of contracting the disease. Such persons are in deadly peril. They can be

saved only through gaining a knowledge of their danger, and of how it may be avoided. The State Board of Health has, a few years ago, entered upon the work of getting such knowledge before the people of Michigan. At its meeting last September it adopted a resolution as follows:—

"*Resolved*, That hereafter, consumption (and other diseases due to the Bacillus tuberculosis) shall be included in the official list of 'Diseases dangerous to the public health,' referred to in sections 1675 and 1676 Howell's Statutes, requiring notice by householders and physicians to the local health officer, as soon as such a disease is recognized."

The purpose of the resolution is to secure, to the local health authorities and to the State Board of Health, information of the location of each case of well-developed consumption, with the view of placing in the hands of the patient reliable information how to avoid reinfecting himself or herself, and how to avoid giving the disease to others; also with the view of placing in the hands of the patient's family, or others most endangered, information how to avoid contracting consumption. Also with the view of instructing superintendents of public buildings how best to restrict the spread of the disease. Without such information thousands will contract this deadly disease, and die. With such information, it is believed that hundreds of these persons may be entirely saved.

Fallacies.

In the minds of some people there seem to be fallacies which prevent them from understanding how it is possible to restrict the dangerous communicable diseases.

The first fallacy to which I refer is that the germs of the dangerous communicable diseases are always and everywhere present, the idea being that, the germs being always present, the "epidemic condition of the atmosphere" is what makes it possible for the disease to spread. We now believe that, for months at a time, the State of Michigan is entirely free from the specific cause of small-pox; we believe that many localities in Michigan are for months at a time, entirely free from the specific cause of scarlet fever, and of diphtheria. I believe that the homes of the people of Michigan are, as a rule, nearly free from the specific cause of consumption, even though the germ of that disease is perhaps more generally spread throughout the State than is the germ of any other dangerous disease. There are probably at least three thousand new cases of consumption occurring in Michigan in every year. In the three thousand households in which the disease has found lodgment, the specific cause is liable to be thoroughly scattered. Some of those households in which the sputa are not carefully dealt with, are dangerous centers of infection. And the *public places*, visited by some of the thousands of coughing consumptives who are now in Michigan, are especially dangerous centers of infection, especially those public places which like postoffices, are liable to have the sputa of visitors deposited on the floor. But the idea that tubercle bacilli are generally distributed, so that all of us are necessarily inhaling them frequently, I believe is a fallacy. I think that the experiments by Koch and by Cornet have proved this. Cornet has found that tuberculous infection is not found in the dust of the streets and in many other places, except in isolated instances. It is a fallacy which I think does much harm, because it leads people to think that it is not practicable to avoid contracting this dangerous disease, except through ordinary hygienic measures, which I

believe we now know to be not always sufficient to prevent the disease. It now seems probable that, given the introduction of a sufficient number of the specific organisms which cause consumption into the body of any person, however vigorous, the disease may be established in that person. Furthermore, it seems to be proved that however debilitated or enfeebled a person may be, consumption does not occur except through the introduction of the specific cause. (Much could be said on the subject of how to keep the human body so as best to resist the contraction of consumption, but that is not the subject of this paper.)

Another fallacy, is that which leads some people to believe that the germs of consumption, and of other diseases, reproduce in the atmosphere. The conditions under which tubercle bacilli reproduce are quite well known. For their reproduction they require the presence of organic material, and a temperature not ordinarily reached by the atmosphere. They can be artificially propagated in and on nutrient substances kept at the temperature of the living body, but they are not naturally propagated outside of a living body.

Another fallacy, is that which causes persons to reason that because we cannot hope to destroy all the germs of the disease therefore there is no use of trying to destroy any of them. How false this mode of reasoning is, may be seen by applying it to that other disease which I have mentioned —scarlet fever. That reasoning was so applied by some in Michigan in 1873; but in 1893, we knew that many thousands of lives had been saved in Michigan by our efforts to restrict scarlet fever. That some other lives were not saved, does not change the fact that thousands were saved. And those thousands were worth the effort.

My belief is that consumption is a communicable disease; that it has been proved to be such by the most scientific methods of experimentation, experience and reasoning; that it is now held to be such a disease by a great majority of the leading men of science who are best qualified to judge. I think we know how it is generally spread, and about what proportion is spread in one manner, and what in other ways. On this last mentioned subject I will, in a few moments, mention a few facts. The fact of its being a communicable disease has I think been too well proved to need further evidence, but the way whereby the bacillus has come to be known as the cause of the disease may be interesting to you. What has long been known as "The Germ Theory of Disease" is now established as true. As regards consumption, it was established by Dr. Koch. He formulated rules which all require to be fulfilled before a given bacterium or special micro-organism can be declared proved to be the specific cause of a given disease. These rules are:

"1. The micro-organism must be invariably associated with the disease.

"2. It must be cultivated outside the body, and through several generations.

"3. Any one of these cultures must be capable of producing the disease if inoculated into a susceptible animal.

"4. The same micro-organism must be discoverable in the animal thus inoculated."

These rules have all been complied with, by many competent observers, relative to tuberculosis, and the micro-organism which causes the disease has been named the *Bacillus Tuberculosis*.

The restriction of consumption by improved methods of ventilation.

I think that all public buildings, including those for schools and colleges should be constructed and managed as if it were believed that some of their visitors will belong to a class of consumptives who will disregard the risk to the lives of the other visitors. The ventilating registers should be at the floor level; and all such precautions should be taken as will reduce to the minimum the danger of the inhalation of the dust of consumptives' sputa. Air that has once been the circuit of an inhabited room should never be warmed over and sent around again to be breathed and rebreathed, with all of its accumulation of microscopic causes of consumption or other disease. I firmly believe that the "indirect" system of heating inhabited rooms is a powerful agent for the lessening of the spread of consumption and of all such communicable diseases; because in order to heat a room well by that method a quantity of air must constantly pass through, and if the foul-air exit is at the floor level, as it should be, much of the dust from the floor tends to pass out, and therefore does not come up to be breathed in, as it does in rooms heated by stoves or by steam pipes or radiators within the room.

When I commend the "indirect" system of heating I refer to the system in which the pure air from out-doors is passed over heated pipes or radiators before it enters the room. I do not approve of relying upon air which enters rooms from corridors in which are placed radiators which there warm the air by the "direct" system. Such corridors are likly to contain the dust swept out of occupied rooms, dust from some one of which may be infectious. Such corridors are liable to receive infectious dirt or dust from the boots and shoes of persons passing through, not to mention the possibility of the sputa of such persons being carelessly let fall on the floor, which sputa when dried may add their infections to the dust which may rise, with the current of air from the radiator, and pass on through the transoms to be breathed by the occupant of the room. When a case of diphtheria, tonsillitis, consumption or other disease which enters the body by way of the air-passages, gains entrance to a building heated by radiators in corridors and ventilated by transoms over doors there are likly to be other cases of such disease. In a disease like consumption, the period of incubation is so long that it is not often that its source can be accurately determined. But we now know that it is safest to avoid the inhalation of all dust, especially that which may contain dust of sputa.

FOUL OR NOXIOUS AIRS.

BY C. C. BUCK, GREEN BAY, WIS.

LADIES AND GENTLEMEN:—The gathering together of these learned gentlemen, for the discussion and the furtherance of so great and important a subject as sanitation, must meet with a hearty approval of all interested in such subjects, and prove a future blessing to those who will learn by these words of encouragement, who now are ignorant of its value to life and health. Had I the words, or the vocabulary of these gentlemen to whom this convention is the outcome, I might, with such a storehouse of knowledge, raise you to that degree of eminence to which none of mediocre could possibly hope to attain. I am not a physician who would of neces-

sity understand the laws of health and those matters which govern them; but only one of many who are following the profession of an architect, designing and erecting buildings for the more physical comforts, for the purpose of housing the people, protecting them from the inclemency of the weather, at the same time giving to them the taste and beauty of art in all its varied forms and colors.

Now, while we surround ourselves with the beautiful in art, why not educate ourselves to the necessity of making our homes, our churches, our school buildings, court houses, and other buildings which we inhabit, healthy and comfortable to live in? Give to them a freshness and invigorating influence by the introduction of pure fresh air, in such condition so as to make the air we breathe a vehicle to health, happiness and comfort. Eliminate all foul or noxious air, so that we can live in an atmosphere of love and pleasure; to enjoy the objects of art and beauty which God, in His wonderful and magnificent benevolence has given to us.

The necessity of ventilation results from the vital importance of having pure air to breathe. To do this is to provide an abundant supply of thoroughly warmed, pure fresh air, and to constantly and surely remove the colder, vitiated air from all apartments so that those necessarily confined indoors may breathe as pure air as those who are outdoors.

Now, while I would wish to treat more fully upon the different systems of ventilation, the time allotted me will not allow of any further words regarding it. I will therefore confine myself to foul or noxious air, its resultant effect and unwholesomness.

Foul or noxious air, in any of its forms, is unquestionably dangerous to health and life. Now, every physician in this assemblage who has thoroughly studied the subject matter will tell you so; he will tell you if you value the physical enjoyments, and the beauties and comforts of home life, that you must banish foul air, unwholsome odors and gases from every part of your home, workshop, store, office building, schoolhouses, churches, and all other unsavory or infected places, and furnish in their place, and in abundance, a full supply of pure air, which most assuredly will keep the blood flowing through your system in a healthy and invigorating circulation, and will aid very materially in counteracting the many tendencies to disease.

The air in your kitchen may be as sweet and pure as that which you can get upon the mountain tops, instead of the foulness which is allowed to permeate and contaminate the whole house, the detection which is at once discovered in your parlor, sitting room, bedroom and even the clothes in your closets.

Water closets may be deprived of their foul odors; cellars and basements can be made dry and sweet, so that you can go into them without the risk of contracting asthma or rheumatism, your sleeping rooms may have the carbonic acid gas which is discharged from the lungs in breathing, with other poisons exhaled from the surface of the body, removed as rapidly as they are gathered; not to be taken back again and again into lungs; and instead of the noxious gases, you will have pure fresh air flowing through your bedroom, in a steady, gentle, continuous volume, and when you arise in the morning instead of suffering with that langour and debility, which many of you no doubt have experienced in sleeping in a close and unventilated room; you will feel refreshed and invigorated fully prepared for the duties and toils of the day. Ladies will show a

healthier and finer rouge upon their cheeks than all the pink saucers can give.

It is absolutely essential that you sleep in an atmosphere that is pure and wholesome instead of a tainted one.

In my experience in the line of my professional duties, I have seen enough in the badly ventilated kitchens, cellars, basements, water closets, offices, schoolhouses, and all sorts of places, to fully satisfy me that a great deal of disease is the direct result from bad air without the cause oftentimes being suspected.

The people have yet to learn that pure air is one of the most essential requirements to a healthy condition. The influence of bad air must be alarmingly apparent to us to go and visit in any of our large cities the abodes of the poorer class of people, in which there is inadequate ventilation or no ventilation, you will find there the children nearly all are suffering with sore eyes and other marks of disease. You will find there many wretched looking objects. When an epidemic has reached us that section of a community is the first to suffer. Now you drive out this impure and noxious air, and properly ventilate these premises, you will find that much of the suffering will be relieved, and much of the diseases will disappear.

Not only man but the domestic animals suffer from the effects of impure air If you closely observe, you will notice this in unventilated stables. The poor animals that do not have a full supply of pure air, gradually sicken, and begin to loose their eyesight. It does not seem to be understood by many that your horse needs fresh, pure air as much as he needs hay or oats.

Now you shut your cow up in a stable where she can breathe nothing but foul air, it is only a question of time she begins to droop and sicken, she cannot yield pure milk under these conditions, it becomes literally a poison. In her diseased condition the milk will partake of the disease of the body, these impurities become incorporated with the milk which is unfit to be taken into the human stomach. Every intelligent mother knows well that her milk is influenced by the condition of her system. If she is peevish and fretful the child will be peevish and fretful. If she eats food that deranges her digestive organs, the child will suffer similarly.

The cow is no exception to the rule, if you want pure milk, your cow must be perfectly healthy and must live in an atmosphere that only tends to that result.

THE FOOD WE EAT.

This is a subject which should receive our attention and care. We not only poison our blood with foul air, but oftentimes do so by the use of improper food. How these noxious gases, which are so detrimental to the life forces, when breathed into the lungs, are also retained in the refrigerator, provision closet and other places where food is stored, those that produce rapid putrefaction. Food can be rendered unwholesome independent of changes which are perceptive to smell. Remove at once the noxious gases in question, as rapidly as they are formed, and you will find that the most perishable fruits (of which strawberries are an example) will be preserved from one to two weeks longer. Fresh meat will keep sweet and good in the hot weather of summer very much longer, retaining at the same time its natural color. Now this proves to us the baneful

effects of noxious gases, not only in hastening destructive changes in our food, but in deteriorating or destroying our health.

Mark Twain is a well-known eccentric and comical genius. He has an odd way of telling homely truths. He went away on the famous "Mediterranean Excursion," a few years ago, and what he says upon the subject of "smells" is worthy of notice. We will quote it for the benefit of those who do not believe in "ventilation." He arrived at "Civita Vecchia the forlorn" as he expresses it, on a hot day in July, and headed one of his letters at large in "Italy." He says: "This is the vilest nest of dirt, vermin and ignorance we have got into yet, except that African perdition they call Tangier, which is just like it. The people here live in alleys two yards wide. It is lucky the alleys are not wide, because they hold as much smell now as a person can stand; and, of course, if they were wider, they would hold more, and then the people would die. These alleys are paved with stone, carpeted with slush, decayed rags, decomposed vegetable tops, and remnants of old boots, all soaked with dish water, and the people sit around on stools and enjoy it. They work two or three hours at a time, but not hard, and then they knock off and catch fleas. This does not require talent, because they have only to grab. If they don't get the one they are after they get another; it is all the same to them, they are not particular."

ITS EFFECT UPON THE BLOOD.

Dr. Mattison says, that noxious gases which find their way much too frequently into our breathing atmosphere, as carbonic acid gas, from the lungs, carbonic oxide from imperfect combustion, and carbureted and sulphureted hydrogen from the decomposition of animal and vegetable matter. The latter gas, so offensive to the smell, is an emanation also from water closets and drains. We can do no better than quote a few words from Dr. Mattison, on this important subject. He says: "Carbureted and sulphureted hydrogen, along with carbonic oxide, are much dreaded when we take into account their peculiar action upon the blood. They produce their effects slowly, but with unerring results. Unless the cause be removed, they darken the blood, that it cannot be restored to a healthy condition by oxygen." Leibig says, sulphureted hydrogen turns the globules of the blood blackish green, and finally black, and the original red color can not be restored by contact with oxygen, because a decomposition of them has obviously taken place. It will be seen, therefore, that the poisonous gases to which we are frequently exposed and obliged to inhale, excepting the carbonic acid, tend directly to decompose or destroy the blood, so that it can never be restored. In the blood is life, says the noted physician, and whatever tends to disturb the healthful condition of that fluid must tend directly in an equal degree to disturb the whole system. Now these gases you see act suddenly and powerfully upon the system. We find many eminent medical authors allege it produces diarrhœa, dysentery, cholera, typhus, ship and jail fevers. But we have these gases frequently in a more dilute form, pervading our kitchens, parlors, sleeping rooms, and yet perhaps not perceptible to the sense of smell. Then indeed we have a secret foe, equally unseen and unheeded, which may sap the very foundation of life without our even suspecting the cause. If we become the victims of bad drainage, etc., we constantly inhale these gases while confined within our homes, and they as constantly decompose or destroy our blood. After sleeping all night inhaling these gases we arise with an unpleasant lassi-

tude, perhaps with a little nauseating tendency, or headache; we go into the fresh air, and those symptoms have left us. In truth, we do not regard them as very important. We renew the inhalations of these poison gases day after day, night after night, until the blood is essentially changed in its healthy composition and with it the whole system begins to suffer in a marked degree, and in some phase of chronic disease. It does not seem to be understood that the blood is partially decomposed, and that its destruction can never be restored by any human agency.

Nor is ventilation thought of as a remedy which, if efficient, would remove every vestige of the noxious gases, which have caused all the difficulty; the first thing indeed to be thought of as a curative means. Thus we are slowly poisoned, perhaps even unto death. We become the victims of a subtle agency of which our senses do not take cognizance; we yield to a cause of disease, which is equally unseen and unheeded, but which is sure and terrible in its consequences.

SMOKING ROOMS.

These should always be ventilated, whether they exist in public places or private houses; even the accustomed smoker would be better not to inhale over and over again the smoke emitted from his cigar or pipe. Nor is the idea a pleasant or advisable one of taking into our lungs the tobacco smoke which proceeds from the mouth of another, mingled usually with an offensive breath, and not unfrequently the noxious effluvia from ulcerated gums and decaying teeth. Hence ventilation is necessary, and in that case you can smoke your cigar in the presence of your wife and daughter, or some anti-tobacco friend, without creating a feeling of unpleasantness or disgust. We find where smoking rooms are not ventilated the wall paper, furniture, and everything in the room becomes saturated with the smoke, and are rendered very disagreeable.

SHOW WINDOW VENTILATION.

In many cases this is important; with the proper ventilation the moisture is prevented from accumulating upon the glass, where it freezes when the weather is sufficiently cold. A show window not ventilated is a hot, dry place in summer, and goods displayed in it are frequently injured or rendered unsalable. Straw goods are liable to be injured, and silks and ribbons have their colors changed (so the necessity of ventilating closets used for storing clothing). Meat and poultry hung up in windows for display are in much danger of spoiling. The very choicest goods are often displayed in the show windows, therefore it is desirable that they should be preserved from change or injury.

CHURCH VENTILATION.

An eminent clergyman has said that it is a sin to be sick, and, if this be true, it is a sin to visit some of our fashionable churches, for by so doing one is almost sure to contract a headache or some other affliction such as usually ensues from breathing in a poisonous or unwholesome atmosphere. It deadens the faculties of the mind and weakens the devotional feelings. The brain is a species of galvanic battery, which works best when stimulated by pure air; it works sluggishly in foul air. Now, why do we see so-

many people sleeping in church? It is, I believe, because of the excess of carbonic acid and other poisonous gases, which accumulate in churches devoid of ventilation, but does not put people to sleep as effectually as the carbonic acid gas from a charcoal furnace in a close room. The only wonder is, that anybody can keep awake in a crowded and unventilated church. With fresh air to breathe during church services, it would be almost impossible to go to sleep. An old Scotch minister on one Sunday saw his whole congregation asleep, except an idiot in the gallery. He stopped, and his people all woke up, and then he cried, "Are you not ashamed to be asleep as I preach the Word, while that poor idiot is broad awake." "Deed, minister," the fool replied, "if I had na been an idiot, I wad a been asleep, too."

"Little Nellie is dying!" This was the mournful expression of an agonized mother to her family physician as he entered the house on a professional visit to her sick daughter. This little girl, of about 12 years, had been sent to school; she was studious and precocious, and always stood at the head of her class. Her health had been impaired by breathing foul air, she often times came home from school with a headache; soon she began to lose her appetite, looked pale and haggard, a cough began to trouble her, she gave up going to school, she gradually grew worse, she was put in the best room in the house, heated by a furnace. The fresh air was entirely cut off, for fear it would affect her or do her injury; doors and windows were made air tight by weather strips; every night as soon as it was dark the room was lighted by argand burners; many of her friends and quite a number at a time would be admitted to her room. It did not occur to any one that the furnace heat, weather strips and argand burners, together with the presence of numerous friends in the room, all tended to make the atmosphere impure and deleterious. The mother, with tears gathering in her eyes, said, "Do you think, doctor, that health is ever injured by foul air?"

"Foul air," the doctor replied with astonishment, "what do you mean by foul air?"

"I mean, doctor, the air we breathe; isn't it rendered foul by breathing it over a number of times?"

"I suppose it is, madame, but not in a sufficient degree to injure health."

"Well, doctor, I have heard of people who have died by poisoned air, which produces its effect slowly upon the system, and gives rise to sickness and ultimate death, while we are ignorant of the true cause of the difficulty."

"It may be possible, madame."

"Doctor, the subject is new to me, but I think it of great importance. I have heard that there is a great deal of foul air in our public schools, owing to the absence of good ventilation. That teachers as well as pupils die of consumption, as a consequence of foul air. I understand clearly now why my little Nellie often came home from school with a headache, and if I had known that her health was in danger she would not have attended school a single day."

"I agree with you, madame, that the air in our public schools is not as good as it ought to be."

During this conversation, little Nellie had been removed to another room, where the warm, pure, fresh air was entering the room in abundance. The little girl recognized the change at once, and said: "I seem to be in a new

world, mama." She then went to sleep. She enjoyed that refreshing sleep which no one can enjoy only under these conditions, and upon waking she looked into her mother's face and said: "Mama, I breathe freely now; I do not cough in this room as I did in the other; I feel as if a heavy weight had been taken from my lungs; I shall die easily; death will come to me like a sweet sleep or a sweet dream, and I shall only be sorry, dear mama, to fly away to the land of spirits and leave you all alone."

Now it is incumbent upon architects to decide all matters pertaining to the ventilation of buildings; it is incumbent upon all who build homes, or committees who have in charge the erection of our churches, school buildings, court-houses, or any other building where life and health is a just consideration, to look into the great importance of all systems of ventilation for removing this foul air, to decide and accept the best under the attending conditions.

It is incumbent upon you, as physicians, to advise all who employ your professional services to advocate the best system of ventilation, that none should be deprived of its beneficial results. We all have an important mission to fulfill. To architects are referred the designing and construction of our buildings, and so long as imperfect ventilation is one of their characteristics, health will be impaired and life shortened. To the physicians, even, has more to do with the health and lives of the people. Physicians are called upon to cure disease, or to patch up the human system as well as they know how; but it should be the province of architects and physycians to prevent disease, which will yet be regarded as a higher branch of professional skill. The old maxim, "an ounce of prevention is worth a pound of cure," should not be forgotten. Pure air is the great panacea by which health is to be maintained. The deprivation of it in our social and industrial relations is one of the greatest evils of our day, and the evil will not be remedied until the construction of our buildings is such as to be greatly improved in this direction. The public will look to us for the consummation of this important matter, and the requirement is as just as it is natural.

Now let us all unite in this one grand achievement; let us therefore carefully study this matter in reference to the welfare of the public, let us fully co-operate in the introduction into our buildings of a method requiring the interchange of a pure air for one that is impure and unwholesome, let us be fully awake to the vast importance of so great and all absorbing subject affecting the health and life of our people, so when the end comes, and we are called to dwell in that great mansion above, where all is love, sunshine, beauty, and healthfulness, we will have then received the blessing of God.

FOURTH SESSION, FRIDAY, APRIL 6, AT 7:30 P. M.

DANGERS OF THE MILK SUPPLY OF MENOMINEE.

BY U. O. B. WINGATE, M. D., HEALTH COMMISSIONER OF MILWAUKEE.

It was expected that Dr. U. O. B. Wingate, Health Commissioner of Milwaukee, would deliver an address on the "Danger of the Milk-supply of Menominee." It was also expected that Dr. J. T. Reeve, Secretary of the Wisconsin State Board of Health, would address the convention on some sanitary subject. Both gentlemen were present during the early part of the convention, and the following letter will explain their sudden departure:

Menominee, Mich., April 6, 1894.

DEAR DR. ROSENBERRY:

I am sorry that our duty calls us away from your meeting. It would be a pleasure for me to remain, but duty comes before pleasure, you know, in our profession. You will not miss much by my going away, so far as anything I might say this evening is concerned, nevertheless I should have been pleased to have complimented you and your city officials, and congratulated your citizens, on the admirable milk ordinance you have. You are certainly entitled to much credit for your faithful work as a health officer and it would give me much pleasure if I could remain, to bear testimony to such.

The case at Fort Howard is a very aggravated one, and I think we should make a thorough and careful investigation at once.

Dr. Reeve informs me that he has explained matters to you, in relation to our seeming rude departure after receiving the kind hospitality that we have.

Sincerely yours,
U. O. B. WINGATE.

DISPOSAL OF WASTE AND EXCRETA.

BY T. J. REDELINGS, M. D., MARINETTE, WIS.

The subject which forms the title of this paper is one of paramount importance. In its relation to our domestic, commercial, and political economy it is an abiding one, equally important to the denizens of our palatial mansions and the humblest cottage. It is not precipitated upon us as an epidemic, but is endemical wherever man has congregated even in small numbers to take up a permanent abode. "Aborigines make a camp over night, and leave the refuse behind them, and nature takes care of it." Civilization makes this impracticable and we must enact laws and devise ways and means to remove from our midst the inevitable accumulation of waste. This problem is one which has harrassed our sanitary scientists through all time, both in this country and abroad, and has rewarded their labors with but partial success.

It is within the last decade that the greatest advancement has been made in this science, which has reached its acme in the cremation and chemical garbage furnace, of which we shall have more to say later.

The sanitary measures of every city should be governed by three principles:

First, To give the inhabitants pure water, free from all contamination, and in sufficient quantity.

Second, The removal, as soon as possible, of the waste arising from the necessary conditions of life, and from all industrial establishments.

Third, The disposal of the waste matter by some approved method.*

It is the second and third of these principles which interest us most in this paper, and in their further consideration we shall use the word garbage as including every form of waste and excreta.

What is garbage? Some one has ably defined it as being anything which is offensive to the senses. Another defines it as all kinds of vegetable and animal matter which is putrescible. In order to be practical, I will particularize. The garbage of a city includes the dry refuse from the house, as dust, ashes, sweepings, refuse wood, inorganic and worthless material which, though not putrescible itself, by its accumulation and presence becomes obnoxious. The excretal refuse, both liquid and solid, from man and animals, together with the waste waters, kitchen offals and dead animals which are quite numerous in certain seasons of the year.

*The Sanitarian, July, '93. Sewerage disposal.

How shall we dispose of our garbage? This is a problem which confronts every Board of Health. It is a gigantic problem, evolving many obstacles. The sewerage system will carry only liquids or semisolids. It provides for waste waters and excreta where the closets have sewer connection; but all the coarser waste materials are still unprovided for. The sewer fails to reach a goodly portion of the dwellings in most cities, and this creates the necessity of making cesspools and midden pits which soon become a common nuisance, polluting the soil and vitiating the atmosphere.

The conditions governing the disposal of garbage in different cities are so varied that each forms a law unto itself. A sewage farm has been annexed to the municipal machinery of many English cities, some of which are self-supporting. A few are found in Germany and France, the one at Berlin is reported as yielding a net profit to the city. In the United States I know of but two, the one a Los Angeles, Cal., the other at Pullman, Ill., where it is said that some profit, above the annual expense, has already been derived from the sale of products.

Within the last decade cremation furnaces have been quite extensively introduced' in England and the United States. The Mertz, Mann, Rider, and Engle furnaces being mostly employed.

The Mertz system has been used in six or seven cities in the United States. The process is not cremation, but desiccation by steam at a temperature of 300° F. After drying, the matter is treated with benzine to extract the fats. The benzine is distilled from the dissolved fats and the dry residue is used as a fertilizer. This system is also known as the Vienna system.

The Mann, Rider, and Engle furnaces are destructors. The estimated expense at which they consume ordinary garbage varies from 25 to 90 cents per ton. The Mann system is in use at Montreal. The Rider at Pittsburg and Alleghany city.

Of the Engle's furnaces, thirty-two have been built in twenty-four different cities and towns, among them was the White City, at Chicago, in '93. The ashes from these crematories has a low value as a fertilizer, but is not enough to be self sustaining.

They are built in four sizes and accommodate cities from 2,000 to 30,000 people. The most striking illustration of the possibility of handling garbage which has come to my notice in the study of this subject, is afforded by the World's Columbian Exposition, and I take the following data from a report by Dr. Morse, published in the December number of the New York Sanitarian:

"From an area of 600 acres, with a resident population of about 40,000 people and a daily attendance of from 150,000 to 300,000 visitors, it was estimated that the garbage, refuse and waste of every kind that must result from their presence would be nearly 100 tons per day, all of which must be collected and disposed of within the bounds of the Exposition, there being no legitimate outlet by land or water for such a purpose. The sewage from the grounds was forced by compressed air into large receiving tanks at the cleaning stations, being about 2,500,000 gallons daily. After treatment with chemicals, and the precipitation of the solids to the bottom of the tanks, the effluent or clarified water was run off into the lake and the residuum pumped into sewage presses and formed into sludge cakes 2½ feet in diameter and 1½ inches thick. An analysis of this sludge gives moisture, 58 per cent, and dry matter, 42 per cent. Of this dry matter, there is about 18 per cent of combustible material, being 6 to 8 parts of

oily or soapy material, and 10 to 12 parts of paper pulp and fœcal waste, the remainder being ashes, lime, earth, and chemical and mineral products. Thus only 18 per cent of the original sewerage bulk can be actually burned. The average daily amount of sewerage sludge burned was 10 tons. The garbage from the grounds sometimes contained as much as 25 per cent of ashes, which always retards combustion and increases the labor of passing it through the furnace grates. There were burned the bodies of two camels, four horses, two cows, two deer, several dogs and smaller animals. The quantity of liquids contained in the garbage was very large. During five months that the crematories were used there were about 5,732 tons of sewage cake and garbage brought to the furnaces, also a large amount of stable refuse and damaged food stuffs; besides the bodies of the dead animals already enumerated. The fuel used in their combustion was crude petroleum. The largest quantity of oil burned in one hour was 71$\frac{6}{7}$ gallons used by six burners. The average of an eight days' test being 37$\frac{1}{2}$ gallons per hour, or 6$\frac{1}{3}$ gallons for one burner per hour. The crude oil can be procured at 3 cents per gallon."

It was estimated that the cost of combustion of these miscellaneous materials will not exceed 50 cents per ton.

The Engle cremators doing this work were located near the Forestry and Anthropological buildings, and were in constant operation. Yet thousands of people passed them without discovering their function or presence. This, it seems to me, has established the fact that such a furnace, if properly constructed and skilfully operated, can be safely located in any portion of a city.

The utilization of garbage for the production of a fertilizer, from an economical standpoint, has not proven a universal success, but striking illustrations of its profitable workings are not wanting. "If the city of New York can receive $93,000 each year for the privilege of picking up the garbage as it is discharged upon the decks of scows, and if the parties holding this contract can make a large sum of money by their crude, imperfect system of handling this material, it is quite certain that if the work were carried on in a systematic manner a great deal larger revenue would be produced. What is true of New York is true, to a greater or less extent in every city of the country. There is less attention paid to the economical operation of garbage disposal methods than should be done; the result is the destruction yearly of a great mass of valuable waste which should be saved at a profit to the city."

The production of heat caused by the destruction of garbage can be perfectly well applied for the production of power, which, in its turn, may be used for municiple purposes. There goes up the chimney of every garbage crematory in the country heat enough to run a steam boiler of 15 to 40 horse power.

The substance of what I shall say upon the utilization of garbage is taken from a practical study of the subject, by Dr. Bruno Terne, and published in the New York Sanitarian, February, 1894.

For the rational utilization of garbage, the process is divided into two main operations:

(1) The separation of the greases by extraction.

(2) The drying of the remainder to form directly a salable product.

City garbage, at a low estimate, will yield three per cent of a black grease, for which there exists a limited market at low figures for lubricating pur-

poses. This black grease has been found to contain as high as six per cent of free fatty acids, but these figures are not constant. There are ways and means known to chemists, however, to improve the raw product, and the refined material made from it will readily find a market in competition with other greases. The black grease yields about seventy-five per cent of this refined oil. This oil, it is said, will prove a puzzle to the best experts in the analysis of oils, for it contains traces of all oils and greases which enter the kitchen. This refined grease is a very excellent soap stock, and as such will find a ready market. To gain the grease, we must apply practical methods of extraction by known solvents, then, to save the fertilizer materials, we must employ the most rapid and economical methods to expel the eighty per cent of water in the material. The dried product is about fifteen per cent of the material as gathered from house to house. This dry tankage is a very excellent fertilizer. Its composition is

Moisture	4.41	parts.
Organic matter, including amonium products	73.34	"
Mineral matter	22.25	"

The value of the fertilizer so produced, is about ten dollars per ton. This does not include the phosphoric acid, potash and grease, which are left out of the calculation to give a practical valuation. From these figures it appears that 100 tons of miscellaneous garbage will yield 30,000 lbs. of fertilizer, or 15 tons, worth $150.

Quoting Dr. Terne's own words, he says, "My experience of many years in handling materials of this kind in enormous quantities, first in Chicago, and since 1877 in the city of Philadelphia, as the chemical manager of the largest works of the kind, permits me to speak advisedly on this subject, and I am prepared to stake my reputation as a technical chemist on the assertion that the utilization of our city garbage can be carried on as a financially successful operation for the saving of the valuable materials contained therein. Capital intelligently invested should be productive, not destructive. Instead of spending thousands of dollars for the erection of crematories to destroy, let us erect sanitary chemical works to preserve this valuable material." There can be no danger to the public health from a rational system for the utilization of garbage, all microbic carriers of contagious diseases being destroyed by a temperature of 212° F.

Thus far we have been considering the disposal of garbage in a general way. Let us look to our local conditions for a moment. It is pretty generally recognized now that filth and disease stand to each other as cause and effect. What is your present method of disposal of this material? Does it meet the requirements of sanitary laws? Does it give you immunity from nuisance? To these questions the answer must be negative. The health officer cannot produce a sanitary condition throughout your city, nor can the common council do this. It requires the concerted effort of the Board of Health, the City Council, and the community, to keep a city in a sanitary condition. The inauguration of a decisive effort in this direction partakes of the nature of a reform. The Board of Health can do much to expedite matters by frequently distributing printed circulars containing instruction on hygiene. To facilitate the collection of garbage the council can make ordinances regulating the disposition of garbage on the premises for the convenience of the scavenger, who should make by-weekly or daily round, as required.

The ashes and putrescible garbage should be kept separate. A regula-

tion garbage box should be established, which should be water-tight and of uniform size, as stipulated by the ordinance. Those having ashes will require two; one for garbage, the other for ashes. The ashes can be used in municipal works. The garbage should be taken to a dump or crematory if one should be erected by the city. Much of the material forming ordinary garbage can be cremated in the kitchen where it is produced. The privy vault should be condemned as a public nuisance, and be replaced by a dry-earth closet. The materials used in its construction, and its dimensions, should be established by law.

In addition to this, the council can appropriate a sum of money sufficient for a scavenging system, which shall be under the direction of the Board of Health.

Before closing this paper, I wish to say a word about the waste carried off by our sewers. For the sake of convenience, we pollute our rivers and lakes, and choose rather to suffer the consequences of drinking polluted water than to adopt rational measures to save, for the enrichment of our fields, the products which the law of nature has provided for the very purpose. "Who can believe that as we near the close of the nineteenth century the people in many of the largest cities in our country are making their infusions of tea and coffee, as well as other drinks, with diluted sewage."

We, on the Menominee, do not form an exception to this unfortunate class.

All sewage should be clarified by chemical precipitation before being discharged into a river or lake which is the source of a water supply.

In closing, I would recommend that the city adopt some approved method of the disposal of garbage with a view to the ultimate utilization of what is valuable in it. The proceeds to be applied to the maintenance of the system.

DISPOSAL OF WASTE AND EXCRETA.

DISCUSSION OF THE SUBJECT, LED BY PROF. DELOS FALL, M. S., MEMBER OF STATE BOARD OF HEALTH, ALBION, MICH.

Prof. Fall's remarks were not in manuscript form and are not here reproduced.

After the discussion by Prof. Fall, Dr. Prindle rendered most excellently a solo. Another solo was admirably rendered by Miss V. Nina Eastman, accompanied by Miss Woodford on the piano, and Prof. Dewey on the violin.

SCHOOL SANITATION.

BY MASON W. GRAY, M. D., MEMBER OF STATE BOARD OF HEALTH, PONTIAC.

At this time of the convention, Dr. Gray read a paper on "School Sanitation;" but, as Dr. Gray cannot now find the manuscript, the address cannot be reproduced in these proceedings. This subject was ably discussed by Hon. B. S. Waite, of Menominee, and his remarks cannot be here reproduced.

CLOSING OF THE CONVENTION.*

The convention was a great success, and the closing was indeed gratifying to everyone connected with it, and especially complimentary to the

hundreds who attended. A hearty vote of thanks to the State Board of Health was embodied in resolutions which were adopted by the convention.

President Wells, of the State Board of Health, made a few very appropriate remarks commending the people who had filled the opera house throughout all four sessions of the convention, for the deep interest which was manifested by those in attendance. He complimented the citizens generally upon the scientific spirit displayed by them. In addition to this he spoke in the most glowing terms of the healthful conditions of the city, not forgetting to pay his respects to the efficient and tireless health officer, Dr. H. L. Rosenberry. In concluding his address President Wells said that of all the places in which the State Board of Health had conducted State Sanitary Conventions it never before experienced greater pleasure than was afforded it in Menominee from the fact alone, if for no other, that the people never for a moment lagged in interest, exhibiting as this did an intelligent interest in the work of the convention upon their part, as well as a courteous bearing toward their visitors.

* There being no stenographic report, the statements under the head "Closing of the Convention," are about the same as printed in the *Menominee Sunday Herald*, April 8, 1894.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

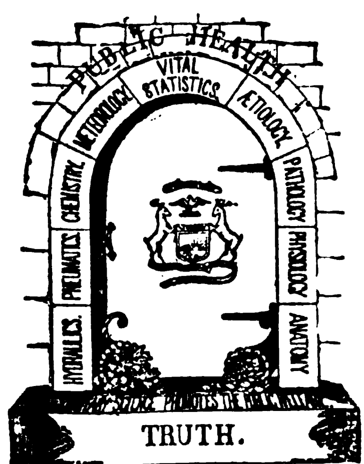
UNION CITY, MICHIGAN,

OCTOBER 25 AND 26, 1894.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF UNION CITY.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1895.]

[No. 424.]



MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1895

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

UNION CITY, OCTOBER 25 AND 26, 1894.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH,
FOR THE YEAR 1895.]

[No. 424.]

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

UNION CITY SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT UNION CITY, MICH.,

OCTOBER 25 AND 26, 1894.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR 1895.

PETITION FROM THE CITIZENS OF UNION CITY.

To the Honorable Board of Health of the State of Michigan:

We, the undersigned citizens of Union City, Michigan, do respectfully petition you for a Sanitary Convention, to be held at Union City, Branch county, Michigan, the date to be definitely fixed hereafter:

John S. Nesbitt, President of Village,
John J. Banford, Trustee of Village,
George W. Buell, " " "
N. E. Yesner, " " "
E. M. Watkins, " " "
S. W. Perry, " " "
A. J. Boyer, " " "
D. J. Easton, Clerk of the Council,
H. S. Mills, Pastor Cong. Church,
G. C. Draper, Pastor M. E. Church,
Wm. Haas, Pastor Baptist Church,
H. W. McIntosh, Supt. Schools,
E. H. Hurd, M. D., Health Officer,
J. W. McCausey, Cash'r U. C. Nat. Bank,
H. T. Carpenter, Cash'r Far. Nat. Bank,
T. B. Buell, Pres. Far. Nat. Bank,
Geo. Styles, Attorney-at-law,
F. C. Wilkins, Druggist,
Wm. H. Hubbard, Druggist,
T. F. Robinson, Editor,
H. Seymour, Supervisor Un. Township,
John I. Copeland, Mem. School Board,
S. L. Kilburne, Produce dealer,
E. H. Page, Postmaster,
D. P. White, Merchant,
M. Vosburgh, Town Clerk,
J. J. Strohm, Druggist,
T. F. Burnett, Groceries,
A. M. Lester, Merchant,
G. K. Whiting, Ex-Pres. of Village,
H. H. Chase, Jeweler,
W. H. Tower, Boots and Shoes,
D. E. Youngs, Justice of the Peace,
F. C. Rheubottom, Fur. and Undertaking,
H. A. Corbin,
Ira C. Hitchcock, Drygoods,
A. R. Barrett, Hardware,
N. E. Tower, Boots and Shoes,
J. P. Jones, M. D.,
M. T. Clay, M. D.,
Isaac Varney,
W. H. Rowe, Dentist,
C. W. Saunders, Boots and Shoes,
A. L. Saunders, Boots and Shoes,
W. H. Bond, Ma'f'g,
Rev. C. D. Paxson, Pastor Abs. Church.

This convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Union City, acting with a committee of the State Board of Health.

The following named persons constituted the various committees:

Committee from State Board of Health.—Prof. Delos Fall, M. S., Albion.

Local Committee.—Dr. E. H. Hurd, Chairman; D. P. White and W. H. McIntosh.

Executive Committee.—Henry B. Baker, M. D., Lansing; T. F. Robinson, Union City, and John I. Copeland.

Music Committee.—George Styles and J. W. McCausey.

Reception Committee.—The Local Physicians. Dr. D. W. Rogers, Chairman.

The officers of the convention were:

President.—J. W. McCausey.

Vice Presidents.—J. S. Nesbitt, Union City; Hon. D. D. Buell, Union City; Ezra Bostwick, Union City; D. P. White, Union City; Dr. W. C. Marsh, Quincy; Hon. M. A. Merrifield, Union City; Ira E. Hitchcock, Union City; Hon. C. G. Luce, Coldwater; George Seymour, Sherwood; Dr. J. S. Ramsdell, Tekonsha; Dr. J. C. Brown, Burlington; Dr. William Wood, Coldwater; Dr. J. Woodcox, Coldwater; T. F. Robinson, Union City; Dr. P. S. Fox, Athens, and Dr. J. H. Anderson, Girard.

Secretary.—E. H. Hurd, M. D., Union City.

The following business and professional men of Union City contributed the necessary funds to pay the local expenses of the convention: J. W. McCausey, H. T. Carpenter. M. A. Merrifield, D. Waterman, L. Ewers, Copeland & Parsons, Ezra Bostwick, Hitchcock & Ruperight, Burnett & Strohm, A. R. Barrett, C. W. Saunders, Minto & Hill, H. Seymour, Geo. Roe, Tower Bros., N. E. Yesner, Buell & Spring, M. Odren & Co., F. C. Rheubottom, Newman & Fisk, D. J. Easton, L. D. Johnson, Lester Bros., E. H. Page, Samuel Corbin, D. P. White, H. W. McIntosh, F. A. Allen, Hubbard & Wilkins, S. B. Frankhauser, Geo. Spring, E. H. Hurd, Jas. Hartford, H. C. Moore, D. W. Mattison, J. J. Banford, O. L. Patterson, Rev. H. S. Mills, G. K. Whiting, H. H. Chase, Woodruff & Son.

FIRST SESSION, THURSDAY, OCTOBER 25, AT 2:00 P. M.

The convention was called to order by Vice President, M. A. Merrifield; and after prayer by Rev. E. V. Armstrong, Hon. J. S. Nesbitt, President of the Village, delivered the following address:—

WELCOMING ADDRESS.

BY HON. J. S. NESBITT, PRESIDENT OF THE VILLAGE.

Mr. Chairman, Ladies and Gentlemen of the Convention: When I was asked to give the address of welcome I refused; but on further consideration thought I would make the attempt, for I knew I would not be called on the second time. But as I have the honor in behalf of the citizens of Union City to bid you welcome, I would have you believe that we

extend this customary courtesy with a pleasure that is genuine and sincere. A representative body of ladies and gentlemen of your profession from the different parts of the State both pleases and honors us. You are our welcome guests, and we tender you our most welcome and fraternal greetings. We are also glad to have you know something of our village and our people. While some of you are in no sense strangers, I apprehend that many will be interested in our village and its natural scenery. Having in mind the saying, "He that bloweth not his own horn, the same shall not be blown for him," I trust I may be pardoned for saying that I think you will find us a rival to many cities double our size. I know we are to be congratulated upon possessing such talented ladies and gentlemen as represent our town in the medical profession. We as citizens know from glancing at the program that there will be great benefits received by having this convention in our midst. We turn the village over to you during the few days of your stay and know you will not be molested, as the Marshal is absent from our streets.

RESPONSE.

BY HON. FRANK WELLS, PRESIDENT OF THE STATE BOARD OF HEALTH.

Sanitary conventions like this and like similar ones which have been held under the auspices of the Michigan State Board of Health, have for their object the dissemination and application of the knowledge concerning sanitary science very recently acquired. It is only during the past two decades that facts have been revealed which have developed a real science from a mass of previously empirical beliefs.

These facts upon which this science is based are practically, today, indisputable. Knowledge of them, like most other kinds of knowledge, becomes valuable in proportion as it becomes popular. Confined to laboratories or possessed exclusively by sanitary engineers and physicians its importance would be very great, but it is only when it comes into the possession of all classes of people that its chief value is felt. A sanitary convention offers the means for bringing to the attention of the men and women, in the community where it is held, this knowledge, which to them, is of more importance than any other they can acquire. It is more important because it protects them in the possession of those most valuable boons of humanity, life and health. When we consider that one-half the deaths, and a still larger proportion of the sickness, which afflict humanity is the result not only of known causes but of causes within our control, can any knowledge be of equal value with that which reveals these causes and how they may be avoided. We meet today to study these causes and to learn what you and I may do to arrest or diminish the vast tide of suffering and death of which they are the origin. From either a selfish or a humanitarian standpoint we could discuss no other subject of equal importance. The list of diseases known to owe their existence to specific causes or organisms capable of being communicated directly or indirectly from one person to another, has continually lengthened until it now embraces not only those well known and formidable maladies, consumption, diphtheria, scarlet fever, measles, and typhoid fever; but also many others with which we are equally and sadly familiar. Each one of these diseases has for its origin a living organism peculiar to itself. Nearly every one of these organisms has been revealed to the eye by aid of the microscope, its habits studied, its method of attack

discovered, and how it affects the tissues of the body learned. This knowledge is rapidly teaching us how best to guard against the attacks of this army of invaders, and to do this, is the great practical fact to be learned. This convention, it is believed will give you the opportunity to consider your local conditions in their relations to this knowledge, with a view to the improvement of such conditions should it be possible. Some of these local conditions, I am glad to observe, are to be presented and discussed by your own citizens, who of course, have most knowledge concerning them. It may not be amiss to mention briefly some of the objects sought to be gained by the Michigan State Board of Health by means of Sanitary Conventions at the present time.. Among these is the cultivation of a strong sentiment in favor of efforts to restrict the ravages of the disease which causes most deaths, not only in Michigan, but throughout the whole civilized world, consumption.

This "great white plague," as it has been aptly termed, is now known to be a communicable disease, caused by a specific, living organism, like all the others. Though usually slow in its progress, few diseases are more certainly fatal. The Michigan State Board of Health was the first official body to recognize the importance of placing this disease in the list of those dangerous to the public health, and requiring of local officers, notices of its existence, with a view to furnishing persons afflicted with, or exposed to it, the best information in its possession to prevent further contagion. Since then the whole world has seemed suddenly to have awakened to the importance of taking prompt and active measures to restrict, and eventually stamp out, this great scourge of humanity..

The disease, its cause, and the several ways by which it is perpetuated, will doubtless be fully discussed during these meetings. Some of the means whereby the Michigan State Board of Health, through legislation and in other ways, hope to do their part toward the accomplishment of this great work may be presented in the hope that your aid for this purpose will not be withheld.

Methods for treating disease after it has gained a foothold will have no place in our discussions. While many physicians are with us today they do not come to teach us how to cure disease, they are here to give us the benefit of their knowledge and experience in the prevention of disease. For this we owe them thanks, for, such prevention means to them loss of the business upon which they depend for a livelihood. Our sole object then is to come together as friends and neighbors to talk over the conditions which surround us, giving to each other such knowledge as we each possess which may render these conditions most conducive to health, and length of days.

ADDRESS,

BY HON. M. A. MERRIFIELD, OF UNION CITY, VICE-PRESIDENT OF THE CONVENTION.

LADIES AND GENTLEMEN:—I hardly know what I am called here for, only to make a speech, and I am sure I am not very well posted on the subject of sanitation. I want to learn all I can and hope to live to see the time when there will be little or no disease or sickness known.

It has been my misfortune to have a great deal of sickness in my family. I have paid a good many dollars to doctors and yet I would be willing to pay a good round sum to promote this good cause, sanitary education.

As I said before, I am not as well posted on this subject as many others are, yet I have given it a great deal of thought, and am doubly interested in it.

It has been said that consumption is contagious; this may be, but good, thorough investigation should be made before the statement should be advanced as a truth, and I ask the medical men to go slow. Yet when they are sure it is, if they are, it should be treated as small-pox, or any other dangerous disease.

Disease comes from the use of impure water, and in the time of war more men died of contagious fevers and from effects of impure water than died from the bullet. This may seem to you a rash statement but it is a fact.

This is not an age of deterioration, it is an age of advancement and the boy of sixteen today can not get into the armor of the old crusader. This is the way it should be. We do not want to rear a generation of invalids and consumptives, and I appeal to you, fathers and mothers, to take an interest in meetings of this kind, read on the subject and teach your children that good old motto, "An ounce of prevention is worth a pound of cure," and before the next century we will have a generation of giants.

Doctor S. H. Clizbe should have read a paper on "The Germ Theory of Disease," but, as he could not be present at this time, his paper was read during a subsequent session of the Convention

THE GERM THEORY OF DISEASE.

DISCUSSION OF THE SUBJECT BY PROF. VICTOR C. VAUGHAN, PH. D., M. D., MEMBER STATE BOARD OF HEALTH, ANN ARBOR.

(Reporter's Abstract.)

Of course it is impossible to discuss a paper which has never been read; but I will endeavor to say something along the line of the subject of the Germ Theory of Disease.

Five hundred years before the coming of Chirst, on the island of Cos, there was erected a temple in which was held a school. This temple was decidedly different from most temples. The sick were requested to inscribe the symptoms of their disease on a tablet, and the priest would inscribe the manner in which the patient was to be treated beneath it. The one person who was most prominent in the beginning of this work was Hippocrates, and he has justly been called the father of medicine. Many of the diseases treated in this temple or school were identical with influenza and other diseases of the present time.

This was 500 B. C., and from that time on I might give you sketches which would bear on the point that these diseases are due to germs, and are contagious.

If you have ever read DeFoe's description of the black plague in London, which is fully as interesting as his Robinson Crusoe, you are fully convinced that this was due to a germ and was also contagious.

Some three hundred years ago leprosy was quite as prevalent in Great Britain as consumption is in our United States today; but now a leper is unknown in that country, and this disease was exterminated just as the State Board of Health want the legislature to exterminate communicable diseases in Michigan. If they will furnish hospitals so that those afflicted with contagious diseases, and are not able to care for themselves, can be taken care of as they should be, in less time than it took to exterminate the lep-

rosy, there will be no consumption or other tubercular disease As soon as a case of leprosy was found, the patient was taken to the hospital, and there taken care of. In some cases the treatment was said to be cruel, in other instances they were allowed to go about, but were made to wear a certain garb, or if in the night, they were obliged to carry a bell, and tinkle it so that they would not come in contact with anyone who would contract the disease.

At the time of the black plague in London 10,000 persons died in four months.

[Dr. Vaughan here gave proofs that consumption is a contagious disease.]

Dr. Robert Koch first discovered a bacillus in the sputa of patients suffering from consumption. To prove that this bacillus or germ was the cause, and the only cause, of consumption, he injected a solution containing the organism into a perfectly healthy animal and from that animal into another, and so on until several healthy animals were inoculated, and the experiment plainly proved, that the so-called bacillus was the cause of consumption. Experiments have proved that the germ is not transmitted by the breath of the patient; but it is thrown off in the sputa, which, when dry. becomes a part of the dust, and is inhaled into the lungs, and the seed takes root just like a germ of wheat, scattered in the proper soil. It may result in consumption of the lungs or bowels or any other organ into which the bacillus happens to fall and does its deadly work.

It is alleged that this is a theory; but suppose your house is infested with rats, and you leave poison for them to eat, and they die, you find them dead from the effects of the poison. Is this a theory?

We have inoculated horses, cows, pigs, guinea pigs, and other kinds of animals with this germ of disease, and in every case the result has proved fatal. Is *this* then a theory? I say *no*! No more than two plus two equal four is a theory. There can be no doubt about it.

There are a few who hold to the old ideas and views, but the majority of intelligent people, after carefully investigating this will be convinced of the fact that consumption *is* a contagious disease.

Suppose a dozen lions were turned loose upon your streets, would you sit quietly by and see them destroy children and friends, or would you make a mighty effort to capture and chain the ferocious beasts?

Friends, we have a mightier foe than this to fight, a more deadly foe, it is the *Bacillus tuberculosis* which is introduced through the food or air, being in the milk or flesh of infected animals, which have been eaten, and it is disseminated in the air about us, from the dried sputum of those who are suffering from the disease, thus constantly endangering us. No public building is free from these germs; and again I say we are constantly endangered, and we should not rest until we have some means provided to eradicate this disease, and banish it from our land.

People die from typhoid fever, scarlet fever, diphtheria, and small-pox, and these diseases are prevented from spreading, as far as possible. With the proof that consumption is contagious, should we not take action along this line? Suppose in a factory in Detroit, we find from one to ten boys and girls working very near each other, they must do this for their daily bread. Among them is one who is scarcely able to do her work, she is suffering from consumption, she cannot leave her work to take treatment, and those about her are obliged to work with her. If she had scarlet fever, typhoid fever, or any of those diseases, she would be obliged to go away.

Now you can see the need of hospitals in the State for these unfortunate people, and I appeal to you to take an interest in this matter. Let us enter into this work at once with a whole soul and willing hand.

[Dr. Vaughan exhibited cultures of the germs of consumption in test tubes.]

Question.—Is there any way to kill the germ?

Answer.—Yes, by burning the sputum, or it may be killed in milk and water by boiling. It may be safely stated that more disease germs are found in milk than any other substance. The filth from the stable is scattered into it, and cannot all be removed by straining.

Too much care cannot be taken about the dairy, for cows are very often affected with tuberculosis.

Question.—How long will these germs live?

Answer.—They may be compared to wheat or corn kernels, they will live until they find the proper soil for propagation, unless destroyed by heat.

THE GERM THEORY OF DISEASE.

DISCUSSION OF THE SUBJECT, BY HON. J. J. WOODMAN, MEMBER STATE LIVE STOCK COMMISSION, PAW PAW.

(Reporter's Abstract.)

I did not come here to take part in the discussions, but to hear these learned men discuss the subjects which they have made a special study, and who can give us some idea of how to preserve our life and health. I have been very much interested thus far, and think while they are proper teachers, I am a "proper" listener.

Of tuberculosis I have little knowledge except what I have seen among animals, and I will take a little time to tell you of one experience I have in mind.

In a town not many miles away, I will not call the name, a farmer owned three very fine animals, a bull, and two cows which were yielding a good amount of milk. The bull standing first in the stable began to emaciate. The farmer became somewhat alarmed about the animal, and consulted a veterinary surgeon, and it was discovered that the animal was infected with tuberculosis. Of course the other two were examined. The one standing next had tuberculosis, and the third had none. If in a herd of cattle one animal is suffering from the disease, it should be killed *at once* for if it is *not*, sooner or later the whole herd will very likely die from the effects of the disease. The *greatest* care should be taken to prevent this, and if care *is* taken there will be no tuberculosis among cattle.

Do we not endeavor to give our children the best kind of food? Should we not then see that our animals which are a part of our food are fed in a way that will make them healthy and fit for our food? Give them good, pure water to drink. Do not allow them to go to any watering place they may chance to find.

SECOND SESSION, THURSDAY, OCT. 25 AT 8:00 P. M.

ADDRESS

BY HON. CYRUS G. LUCE, EX-GOVERNOR OF MICHIGAN, COLDWATER.

Hon. Cyrus G. Luce, of Coldwater, Ex-Governor of Michigan, addressed the Convention at considerable length. He spoke rapidly, and no good stenographic report was obtained. The Ex-Governor strongly endorsed the theory that consumption was contagious, and spoke at length on the work of the State Board of Health, and of the Sanitary Conventions, in relation to the restriction and prevention of consumption and other contagious diseases.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF A LAWYER.

BY GEORGE STYLES, UNION CITY.

For the purposes of this convention, the subject now under discussion, has been divided, so as to be treated under different heads, by different speakers. The division assigned to me requires me to treat it from a legal standpoint.

The public health of the people must necessarily be of primary importance in the municipal law. Perhaps no legal code has ever existed, which did not make some provision for the preservation of the health of the people. While, however, recognizing its great importance, yet the limited scope of the statutory provisions regarding it, has necessarily been marked because of the restricted knowledge of sanitary laws, in the centuries prior to the nineteenth.

However interesting it might be to trace this subject, as it crops out here and there, in the history of various nations, time will not permit me to do this, true though it is, that the student of sanitation knows no country or language, for his subject is as broad as humanity, and he reaches for light into every zone. As Anglo-Saxons, we are interested especially in our own race, and the Public Health as it has been provided for by those of our own cult, should have perhaps a little more interest for us. Nearly three hundred years since, viz., in the first year of the reign of James 1st, we find parliament enacting, that if any person infected with the *plague* or inhabiting an infected house, be ordered by the mayor, or constable, or other head officer of his town or village, to keep his house, shall disobey this order, he may be compelled, by the watchman appointed on "such melancholy occasions," to obey such order. And if such person refuse to obey such order and go abroad he shall be punished as a vagabond "if he have no plague-sore upon him" but if he have any infectious sore upon him "uncured," he shall be deemed guilty of felony. This meant that he was amenable to punishment of death. Provision was also made for a quarantine of forty days of ships coming from infected places. I do not

know whether medical men are agreed as to what this *plague* was. I think it was Dr. Vaughan, who, this afternoon made a reference to the terrible plague of London in 1665, and which counted its victims to the number of nearly 100,000.

Was this term *plague* a convenient one to designate the more striking infectious diseases, or to characterize some well-known form of repulsive contagion? Or did the doctors in those days call every infection a plague, just as a good many of them today when they are called to treat a disease which they cannot make out, save their wisdom, by calling it grip?

Does the *plague-sore* of the statute refer to small-pox? If so, then the virtue of isolation was as strongly insisted on then as it is today in dealing with that repulsive disease. It may have been leprosy, for one of the medical speakers at this convention has given us some startling statistics which I, for one at least, was not prepared for, showing the terrible prevalency of that disease and how it was at last completely stamped out in England by the mere force of legal enactment, just as he argues consumption can be virtually destroyed in Michigan, if the people will give the health officers the necessary authority. Coming to the United States we find that congress early made provision, in behalf of the public health, by declaring by the Act of February 25. 1799, that the quarantines and other restraints, established by the health laws of any State, respecting the entry of vessels from foreign ports, shall be duly observed by the collectors and all other officers of the revenue of the United States and such officers are required to faithfully aid in the execution of such quarantine laws. This Act is lengthy, and very minute in its details and shows an intelligent appreciation of its subject. Of course it may well be assumed, that every State has made careful provision for the care of the health of its citizens, and Michigan has vied with every State to the same end. As soon as it became a State it passed a law under the heading of Public Health, and declaring that at every township meeting the voters may choose a health board consisting of not less than three, nor more than nine persons, or they may choose one person to be health officer and who shall thereby be clothed with all the power of a health board. If no board of health, or health officer were chosen the township board became the board of health.

Very soon afterwards, the legislature established, what is now, the township board of health. At least for nearly fifty years we have had substantially the same law on this subject. Effective work, however, was not likely to be wrought under that system. Whatever good it might do in localities enlarged effort was not possible.

The increasing needs of a rapidly growing State required the establishment of a body en rapport, with the subject of public health preservation; and this required the oversight of the work to be committed to men, whose professions made them enthusiastic in such labors.

These needs induced the legislature of Michigan to create a State Board of Health, and with the establishment of this institution commences, for Michigan, the scientific treatment of public sanitation on a scale commensurate with the prominence of the State. This law makes the board of health to consist of seven members, six appointed by the Governor, with the consent of the Senate, and these six elect a Secretary. The secretary holds his office during good behavior. He is largely responsible for the efficient working of the board. He keeps the records of the board and all books and papers belonging to it.

He is required to exercise a kind of supervision over the local boards of health, imparting to them such information as he may think will be of benefit for the preservation of the health of the townships; in other words, he is in constant touch with all parts of the State, through the local boards, receiving from them reports of local sanitation. He is the only officer on the State board who receives a salary; the others, being allowed only their necessary expenses while employed on the business of the board.

The legislature did a noble piece of work when it created this board. Let it continue its wisdom in this behalf, by heeding the requests of the board for the furtherance of the objects of its creation. This board is supposed to be an expert on the questions arising in reference to public sanitation and its opinions are entitled to respect as such.

Its work is not a bundle of theories, but of accomplished facts. True, it cannot render human life impervious to disease, but it can go far in the line of reducing such deaths to a minimum. Its records show that for the four years prior to its organization the number of deaths in Michigan in every 10,000 inhabitants from that horrible disease, scarlet fever, was nearly five, while in the six years succeeding the creation of the board, it was reduced to 2.24. For the same periods the deaths from small-pox were .85 and .16 respectively. An even greater prevention has resulted since, for we find that from 1886-90, that in 366 outbreaks of scarlet fever, where the requirements of the board were practically unheeded, there were 13.29 cases and .69 of one death per outbreak, while the enforcement of the board's requirements, in 361 outbreaks, produced the result of 2.35 cases and .13 of one death per outbreak. Of diphtheria, which is perhaps the most dreaded of malignant infections, neglected isolation and disinfection in 317 outbreaks produced 13.57 cases and 2.67 deaths per outbreak, while intelligent isolation and disinfection in 252 outbreaks resulted in 2.04 cases and .48 of one death per outbreak.

This board of health, speaking in this connection, promises equally effective work in consumption if the State will grant them the opportunities for dealing with it which they claim.

And in view of what scientific humanitarianism has done for the race during the last 200 years, he would be a foolish reasoner who would limit their possibilities.

RESTRICTION AND PREVENTION OF DANGEROUS CONTAGIOUS DISEASES.

FROM THE STANDPOINT OF THE CLERGYMAN.

BY REV. H. S. MILLS, UNION CITY.

Man has a three-fold nature. He is composed of body, soul and spirit. A combination of these three elements is necessary to constitute the being that we call "man." The absence of any one of these elements would prevent him from being a man, whatever else he might be. And he is by so much less a man in proportion as any one of these elements is impaired or lacks development.

It has sometimes been thought, and it would seem that to a considerable extent the teaching and practice of the clergy had been conformed to

that idea, that God cares only for the spirit—that he regards the body and the mind as of trifling consequence—and that it does not matter much what becomes of them, how they are treated or what development they receive, if only the spiritual nature be properly cared for. Proceeding on this idea the pulpit has treated almost exclusively of spiritual matters, oftentimes dwelling upon these themes which many of the people, because of their meager spiritual development, were not in a condition to appreciate. Not having much appreciation of spiritual things, and supposing that God cares for nothing else, it is not strange that many people have an idea that God is not very much interested in them. God cares for *men*. It is not the spirit that he loves or the body or the mind exclusively. It is that combination of body, mind, and spirit that we call man. Each element in the complex nature of man he properly estimates, and while I would not say that the mind or the body are as important as the spirit, God cares for the one as truly as for the others. He has made provision for the care and development of the mind and body as well as of the spirit. He has made laws that govern the former as well as the latter. The laws that govern our physical and intellectual natures are just as truly an expression of the will of God, as those that govern our spiritual nature, and the willful infraction of the one is as truly sinful as the willful violation of the other. The same God who said "Thou shalt not steal" and caused Moses to write it on tables of stone, has said, "Thou shalt not eat green apples" and caused it to be written on the fleshly tablets of our physical nature. The one law is as plainly the revealed will of God as the other. The will of God as recorded in the experience of the race is as sacred and authoritative as that recorded in the Decalogue. Punishment follows the breaking of the one as truly as the breaking of the other.

It is high time that the clergy in its practice and teachings should proceed upon the basis that all God's laws are authoritative, whether they apply to the body, the mind, or the spirit. And the church is waking up to the fact. Its minister formerly handed men over to the physician in all things that pertained to the body, and to the school teachers in all things that pertained to the mind, and was very careful to keep himself within the limits of the spiritual in his ministrations. But now he tells men that God loves *them*, not their souls exclusively. He explains the nature and application of God's laws to the mind and body as well as to the spirit, and insists upon obedience to them. And I have not heard that the physician or the teacher have charged him with an invasion of their territory. The minister of the Gospel is by so much less a true minister of the whole Gospel if his ministrations do not extend into the physical and intellectual realm. I might also add that the physician is by so much less a true physician and the teacher is by so much less a true teacher if he is incapable of ministering in the spiritual realm. While the physician, the teacher, and the minister each has his special department, each must, if he would fill out the full measure of his usefulness, be able to ministter to the whole man.

The standpoint from which a clergyman views the subject of the Prevention and Restriction of Dangerous Communicable Diseases, must be the sacredness and binding force of all Divine Law. If the laws which God has made in respect to such diseases were strictly obeyed, I suppose that they would cease to be communicated, if they did not disappear altogether. As I understand it the work of the State and local boards of health, is to discuss those laws, explain and publish them. The object of this Sanitary

Convention is to disseminate such knowledge. This I consider a very practical way of preaching the Gospel of good health, which I believe to be a true Gospel so far as it goes, and it goes a long way. I conceive it to be the duty of clergymen to inform themselves thoroughly in these matters, and to second in all possible ways the efforts of the State and local boards of health. They must preach from the pulpit the doctrine of cleanliness and show how God has made disgusting and deadly diseases the punishment for filth. They must show the moral value of the bath tub and the spiritual efficacy of soap and fire as cleansing agents. They must preach the duty of vaccination as well as regeneration. A minister should instruct his people in the matter of the isolation of those sick with contagious diseases. If they have a bad boy with a foul mouth or a leprous soul, or a boy sick with scarlet fever or measles, neither of them should be allowed to run at large to spread the contagium. They should be shut up and cared for, skillfully and tenderly until the danger is over. This should be emphasized as a christian duty. If there is peril of an epidemic and if the dread angel of disease is hovering over a community and the local board of health shall order a quarantine, the minister should show the reasonableness of the order and emphasize the necessity of its being obeyed. The minister should explain and insist upon the moral responsibility, which heads of families and guardians of the public in cities and villages, have in this regard. It has been demonstrated that contagious diseases can to a very large extent be prevented and restricted, if certain precautions are known and enforced. If they are not known in these days the ignorance is criminal. If they are known, but not taken, the criminality is even more apparent. To a considerable extent parents and health officers hold in their hands the lives of those for whom they care. They should be made to feel this responsibility. The public should be instructed to hold them responsible for carelessness or neglect. The standpoint of a clergyman is the standpoint of the Gospel. The Gospel is not for the spirit alone. It is for the whole man. It contemplates the regeneration of the whole man, body, mind and spirit; the cleansing of the whole man; the consecration of the whole man to the service of God; the development of the whole man; the proper care and conservation of the whole man. Therefore when any part of a man, body, mind, or spirit is in danger of contagion, the man who would preach the Gospel must give warning of that danger, and teach the public how to avoid it. What we want is more healthy men and women —men and women who are sound in body and soul. The Gospel of Jesus Christ rightly interpreted and faithfully lived will do more to make such men and women than any thing else. It is the clergyman's work to join hands with the physician and the teacher in thus interpreting and preaching "the Gospel of Good Health."

RESTRICTION AND PREVENTION OF DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE BOARD OF HEALTH.

BY HON. D. D. BUELL, UNION CITY.

A confederate guard in South Carolina during the war was questioned as to his knowledge of his duties: You know your duty here do you sentinel? Yes sir. Well now, suppose the northern army should open on

you with heavy shot and shell what would you do? Form a line sir. What! one man form a line! Yes sir, a bee line for camp. And so if I were questioned as to my duty as a health officer, I would get as near it as did the sentinel.

Perhaps there are no two boards of health who look on this question exactly alike. It depends largely on the vocation of each individual. If there is a doctor on the board and small-pox should break out between Detroit and Chicago, he would be liable to order a free vaccination, and some people are ungracious enough to say that he does it for the fifty cent pieces there are in it.

We have just heard the subject treated from the standpoint of a lawyer, but it is proverbial that there is a retainer of $25 even in such cases, which I did not hear mentioned.

Should there be a farmer on the board, dwelling as he does in sparcely settled districts, and less liable to contagious diseases, I have heard it intimated that he would be about as philanthropic as the deacon of whom I once heard making a prayer.—"Bless me and my wife, my son John and his wife, us four and no more, amen." Or, in other words, he would look out for his own family and let every one else do the same. But I am glad to say that the "Grangers" are not all built in that way, even in Union City.

The business man takes an intermediate ground between the doctor and the farmer. He would pass resolutions of a startling nature, setting forth the great danger that is surely to be in our midst and knowing the value of printer's ink would have them inserted in the paper, headed in large capitals, *It is death, do not delay,* and the panic stricken people hasten to ward off the danger by vaccination, and after those who were able to pay for vaccination had been served he would perhaps order free inoculation for the rest, provided it was really necessary.

I think if every town board had an opportunity of visiting Dr. Baker's office at Lansing and would interest themselves in the working of the State Board of Health, see how thoroughly it is systematized, they would take a broader, a more comprehensive view of this subject of gigantic importance, and when any dreaded contagious disease pervades or threatens our commonwealth we would take those necessary precautions, acting on the principle that "An ounce of prevention is worth a pound of cure."

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF THE PRESS.

BY HON. D. J. EASTON, UNION CITY.

I do not know that I have ever before had a subject assigned me for discussion where I have been so completely at a loss to determine upon what line it must rest. In lighter vein I would insist that pretty nearly all communities are sorely afflicted with a lack of appreciation of those things that come to them through the medium of the country press. An individual neglects to compensate the publisher for what he sends to him. This is "communicable" to others, and in time it becomes "contagious."

"The Prevention of Dangerous Communicable Diseases from the standpoint of the Press" is a subject, the scope of which can only be compassed by the imagination and ability of him who writes upon the subject. The relation of the press to those things that so greviously afflict humanity is substantially the same as it affects those of other professions. The "Faber pusher" of today belongs to the *genus homo*, and is subjected by existing conditions to the same trials, the same joys as are others of his kind. It is true that he has an enlarged field in which to operate. While others speak to scores, he speaks to thousands. Perhaps it is this that gives the press the long end of the lever in the discussion of important public questions. The press is argus-eyed. It is ever on the lookout for items of interest and eagerly scans every nook and corner in search of what it may regard as of use to its readers. Sensational items, with flaming headlines, that make the people stand aghast with horror depicted on their countenances, are eagerly read by the public, and he who presumes to conduct a newspaper without at least occasionally gratifying, what may perhaps be regarded as the morbid appetite of the people in this direction, is held to be a "back number."

The pleasing things that go to make up the life and history of a community are quietly scanned and scarcely thought of more. I do not mean to say by this that the press gloats in ghoulish glee when diseases inimical to public health make their appearance within the territory covered by its circulation; but if these must come, they are anxious to chronicle the fact, because it is certain that this much of the paper will be read with real interest. Since sanitary science has come to stay in the more enlightened communities, the press has had less to contend with in the publication of these items than in the past. Less than two decades ago if a case of small-pox were to break out in any community, the first person to be seen by the physician, after his patient, was the editor. He would most solemnly assure the disseminator of news, that there was no danger to be apprehended if the facts could be suppressed. An item in the paper would be a notice to the world, business would be paralyzed, because no person would dare to set their feet within the corporate limits. If inadvertently the facts become generally known, then the editor was implored to state that it was only a very mild type of varioloid and that with the safeguards thrown around the case, no danger of its spreading was possible. In fact it was so mild and gentle that it was really a pleasure to have it; that it was hardly contagious or communicable from one person to another.

Now, under the direction of wise legislation backed by the authorities of boards of health, certain diseases are required to be placarded. Instead of undertaking to keep the fact of their existence from the public, it is given to the people, both through the press and through the other channel referred to. By the adoption of this the press has been largely instrumental in preventing the spread of many of those diseases that are communicated from one to another, and thus sap the foundation of human life. For years before these laws were enacted the press of Michigan was their earnest advocate, and for years it stood in opposition to the mercantile communities who let the almighty dollar stand in the way of that which was subsequently accomplished. In a financial way it antagonized a class that gave it material support.

In view of this and of much else, we do not believe that the press in whole or in considerable part can be called selfish or sordid. It has always stood out with more or less firmness for what it has regarded as the right,

let the consequences to it be what they may. It is an educator of the people, many of whom from one year's end to the next have no reading but it.

The books on the shelves of our more pretentious citizens are not found in counterpart in the homes of the more lowly. There never has been a time since Dr. Faustus began the placing of movable type into words and sentences, then imposing them into pages and sending out their reflections on the crude paper of that time to the people, when the press has been so free to discuss all public questions, sanitary and otherwise, than at the present.

The position taken by any individual, whatever may be his sphere in life, from president to laborer, is no bar in the way of the advocacy of a measure or of its condemnation. Boards of public health, preachers of the gospel, politicians of all classes, all are discussed, and their manners and methods given to the public with an accuracy that is wonderful to those not initiated into the mysteries of the profession.

There is no place so sacred to the press that it does not enter and criticise. It advocates all that is best in society. It points towards heaven as it tells of the horrors of hades. Every board of health has the hearty support of every paper in Michigan, and in their laudable work of reducing disease to the minimum their hands are upheld in every particular.

With the idea of a betterment of the sanitary conditions of this village the local press took up the question of the water supply. It believed that, among other things, good, wholesome water had much to do with the health of the people, and that many of the diseases such as typhoid fever, diphtheria, etc., could be eliminated by providing a supply of pure water to the inhabitants. The press also recognized the fact that the dust and dirt and filth that every hour of the day was drank into the stomach and lungs of the people could be somewhat lessened by a good system of water works, and that many other things connected therewith would add to the comfort and pleasure of the people. The local press was the pioneer in the advocacy of this great sanitary measure, and issue after issue was sent forth to the people, explaining the system, and telling of its advantages, of its hygienic relations to the people, until finally a result was reached by which the system now under construction was commenced. To the press and its intelligent constituency are the whole people indebted, and they will reap the benefits resulting from the most desirable thing.

In after years, when beneath the shady bowers of this beautiful city shall sit many of its people, as they watch with joyous satisfaction the little jets of water springing up into the ambient air, cooling it from the torrid heat of the summer's sun, we expect they will raise their voices in thankfulness to the Giver of all good, because he implanted in the minds of the press of Union City the idea of the beneficial results of pure, fresh, sparkling water for the people.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES

FROM THE STANDPOINT OF THE STATE BOARD OF HEALTH.

BY DELOS FALL, M. S., MEMBER STATE BOARD OF HEALTH, ALBION.

The Michigan State Board of Health was organized a little over twenty years ago, and, from that time to this, has persistently carried on a campaign of education of the people regarding the nature of the dangerous communicable diseases and the means of their restriction and prevention.

For the benefit of some in the audience who may not know, it may be well to speak of the organization of this Board and its method of doing work for the public health. The Board consists of seven members, six of whom are appointed by the Governor by and with the consent of the State Senate. Two members are appointed at each session of the legislature, their terms of office being for six years. The six members receive no salary, simply being paid their actual expenses while on duty. This being so, the positions on the Board have not been sought by the ordinary run of political office seekers and our Governors have been free to appoint men with some regard to their fitness for the place. At the present time, four of these men are physicians and two are laymen. The seventh member is the Secretary who is elected by the Board. His term of office is during good behavior and as long as he renders acceptable service. The Board has had but one Secretary and it may be said that Michigan has been fortunate indeed that this office has been so ably filled as it has by our very efficient and capable Secretary. Through his labors the Board and the State have become favorably known the world over.

The office of the Board is in the State Capitol at Lansing. There the Secretary presides over an office in which a force of ten clerks are constantly employed studying the communicable diseases, especially those which cause most deaths in Michigan. The work of the Board is three fold, viz: (1.) The collection of information concerning the causes of deaths and especially of those which, from their nature, can be restricted and prevented; (2.) the compilation, preservation and study of all facts which bear in any way on the public health; and (3.) the dissemination among the people of the information thus gained that they may have the benefit of everything that will save lives and prevent sickness.

Co-operating with the State Board in carrying on this good work is an army of several hundred health officers. Our State law provides that the supervisor, clerk, and justices of the peace in the township, and the councils and mayors of cities or presidents and trustees of villages shall constitute a board of health for their respective jurisdictions and that all of these bodies shall appoint a health officer who shall have executive power and act in all cases when the public health is concerned. There are 1,178 townships, 66 cities, and about 200 villages in the State of Michigan and there should thus be about 1,500 health officers.

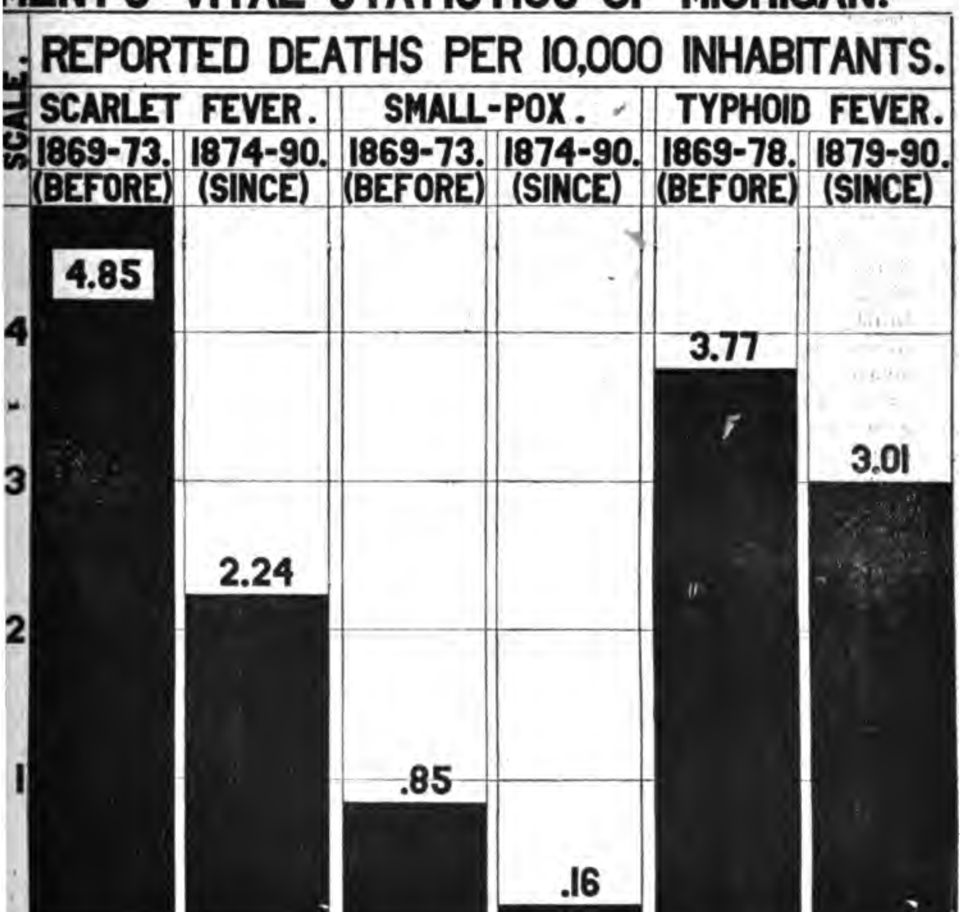
Again the law contemplates that this army of sanitary workers shall be reinforced by the ranks of the practicing physicians, for, Section 1735 of the compiled laws of 1871 reads as follows:

(1735.) SEC. 44. Whenever any physician shall know that any person whom he is called to visit, or who is brought to him for examination, is infected with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof to the health officer, the president, or the clerk of the board of health of the township, city, or village in which the sick person may be; and to the householder, hotel keeper, keeper of a boarding house, or tenant within whose house or rooms the sick person may be. The notice to the officer of the board of health shall state the name of the disease, the name, age and sex of the person sick, also the name of the physician giving the notice; and shall, by street and number, or otherwise, sufficiently designate the house or room in which said sick person may be. And every physician and person acting as a physician, who shall refuse or neglect immediately to give such notice shall forfeit for each such offense a sum not less than fifty nor more than one hundred dollars:* *Provided*, That this penalty shall not be enforced against a physician if another physician in attendance has given to the health officer, or other officer hereinbefore mentioned, an immediate notice of said sick person, and the true name of the disease, in accordance with the requirement of this section. § 1676 Howell's statutes, as amended by Act No. 11, Laws of 1883.

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

LIVES SAVED BY PUBLIC-HEALTH WORK.

COMPARISON OF DEATH-RATES IN MICHIGAN FROM SCARLET FEVER AND SMALL-POX BEFORE AND SINCE THE STATE BOARD OF HEALTH WAS ESTABLISHED AND FROM TYPHOID FEVER BEFORE AND SINCE ITS RESTRICTION WAS UNDERTAKEN BY THE STATE BOARD. COMPILED FROM STATE DEPARTMENT'S "VITAL STATISTICS" OF MICHIGAN.



LIVES SAVED FROM: SCARLET FEVER (17 YEARS) 7,268; SMALL-POX (17 YEARS) [illegible]; TYPHOID FEVER (12 YEARS) 1,871.

SEC. 50. For each complete notice in writing to an officer of the board of health in full compliance with the preceding section, requiring from physicians or other persons notices of diseases dangerous to the public health, the physician who gave the notice shall be entitled, on duly certifying that each notice was correct, and when the bill has been duly audited by the board of health, to receive from the township, city, or village, in which the notice was given, the sum of ten cents. Act No. 11, Laws of 1883.

And again, our law provides that you citizens shall have a part in this great work. It makes known your duty and attaches a penalty for neglect of that duty. This law should be read and commented upon at every one of these sanitary conventions. The law for the citizen is as follows:

(1734.) SEC. 43. Whenever any householder, hotel keeper, keeper of a boarding house or tenant shall know or shall be informed by a physician, or shall have reason to believe that any person in his family, hotel, boarding house or premises is taken sick with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice in writing thereof to the health officer, the president, or the clerk of the board of health of the township, city or village in which he resides. Said notice shall state the name of the person sick, the name of the disease, if known, the name of the householder, hotel keeper, keeper of boarding house or tenant giving the notice, and shall, by street and number, or otherwise, sufficiently designate the house in which he resides or the room in which the sick person may be; and if he shall refuse or willfully neglect immediately to give such notice, he shall be deemed guilty of a misdemeanor, and upon conviction thereof he shall be punished by a fine of not exceeding one hundred dollars and costs of prosecution; or in default of payment thereof, by imprisonment not exceeding ninety days in the county jail, in the discretion of the court:* *Provided*, That such fine or imprisonment shall not be enforced if the physician in attendance has given to the health officer or other officer hereinbefore mentioned an immediate notice of said sick person and true name of the disease, in accordance with the requirements of this section. § 1675, Howell's statutes, as amended by Act No. 87, Laws of 1889.

The law still further places responsibility on the supervisors, township officers, and prosecuting attorney.

It will be an interesting question to ask: How thoroughly is the law carried out? First of all it must be answered that from the standpoint of the State Board, every resource within their reach is utilized to the utmost extent, that no effort is spared, that the Secretary and his office force are constantly and persistently active to further this work. Their motto is, "This one thing I do." I wish I might impress upon you how great is our desire, how unbounded our enthusiasm that the work of life saving may be in the highest degree successful. Let me outline the work something in detail: Every health officer is supplied with blanks from the office at Lansing, for reporting outbreaks of diphtheria, typhoid fever, scarlet fever, small-pox, measles, etc., (dangerous communicable diseases) to the Secretary of the State Board of Health. Upon the receipt of the report of an outbreak of such disease, blanks for weekly reports during the outbreak are sent, with a circular letter, also a number of pamphlets containing instructions for the suppression of the particular disease. These pamphlets are to be distributed to the neighbors of the family in which the disease is, in order to obtain their co-operation with the health officer.

About 1,669 outbreaks of such diseases were thus attended to during the fiscal year ending June 30, 1891. Later a blank is sent to each such locality for a final report at the close of the outbreak, stating just what was done for the restriction of the disease, and with what result, the number of cases and deaths, households invaded, what disinfectants were used, in

* Supervisors must prosecute for all such forfeitures; township officers must give notice to supervisors; prosecuting attorney to conduct suit if requested; see sections 8439, 8440 and 8442, Howell's annotated statutes. Health officers of villages and cities must notify prosecuting attorney of all violations of this section,—see § 1684, Howell's statutes; the prosecuting attorney must prosecute for all such forfeitures incurred within his county,—see section 8442, Howell's statutes.

what quantities, and other facts supplying important data for future efforts. The facts thus collected are compiled for publication in the annual report of the Secretary.

The State Board are also engaged in collecting sickness statistics and the Secretary of State collects vital statistics. The health officers of cities and villages and other leading physicians are enlisted in the work of sending weekly postal card reports of diseases to the office at Lansing, and the sickness statistics of Michigan based upon these weekly reports by the leading physicians in the State are probably the most important sickness statistics in the world. Combined with this is a most excellent system of meteorological statistics which have now been collected during such a long series of years as to make them exceedingly useful and valuable. Thus through the system of reports to the State Board of Health, by its constantly increasing corps of correspondents, as well as by the local health officers and by a systematic searching of the local columns of the country newspapers published in Michigan, the Secretary of the Board seeks to obtain information of every outbreak of disease in the State.

Distribution of Information.

It would be labor thrown away if all this information were to be kept locked up in the office of the State Board. It must be compiled and studied, all the obvious lessons learned and the whole matter put into such shape that it may be utilized by the people for whom the labor is performed. This work requires the constant labor of several clerks, who by long training are enabled to show the people and local boards of health how they may act promptly and effectively in the stamping out of a disease, before it has spread. This is done by means of pamphlets which are prepared by the Secretary and his clerks, giving just the information which the people need. Thousands of pamphlets on each of the most dangerous communicable diseases are distributed by the State Board in the localities where the particular disease treated of in the pamphlet is present. Copies of the pamphlets on diphtheria, scarlet fever, and small-pox have been printed in German and in Dutch, and a leaflet on contagious diseases in French, Polish, Swedish, and Danish-Norwegian and these are sent where it is thought they can be used to advantage.

About 70,000 copies of these documents are thus sent out each year.

Quarantine.

The work of the Board is not altogether confined to the limits of the State. Many outbreaks of diseases each resulting in the death of many persons arises from the germs of disease which are brought into the State by emigrants from the old world. Cholera has threatened to invade this country for the past two or three years and a vast amount of labor has been performed by the Board in their efforts to keep this dreaded disease from invading our State. Michigan is a border State and the danger has been as real for us as for New York or Massachusetts. In the same way small-pox is very frequently brought into the State. This necessitates that we should constantly have official relations with the boards of health of other States and in fact of the whole world.

By this brief and very imperfect account of the work of the State Board it may be seen how large are their labors and how ambitious their plans for the welfare of the people of the State.

Some Useful Lessons.

One of the valuable lessons which was early learned by the board was that those diseases which cause most sickness do not necessarily cause most deaths, and by the knowledge thus gained it was known which diseases ought to demand the greatest amount of attention by the board as well as those which might more safely be ignored. I here present in two parallel columns the names of twenty-eight causes of sickness and twenty-eight causes of deaths in Michigan for a period of ten years, arranged in the order of their prevalence and beginning with the highest:

Order.	DEATHS. Alleged Causes and Conditions of Deaths.	Order.	SICKNESS. Diseases arranged in order of greatest prevalence.
1	Consumption.	1	Rheumatism.
2	Diphtheria and Croup.	2	Neuralgia.
3	Pneumonia.	3	Bronchitis.
4	Still-births, Injuries at Birth, etc.	4	Intermittent Fever.
5	Violent Deaths.	5	Consumption, Pulmonary.
6	Old Age.	6	Diarrhea.
7	Heart Disease.	7	Tonsillitis.
8	Cholera Infantum.	8	Influenza.
9	Typhoid Fever.	9	Remittent Fever.
10	Brain Diseases.	10	Pneumonia.
11	Paralysis, including Apoplexy.	11	Erysipelas.
12	Infantile.	12	Inflammation of Kidney.
13	Bowel Diseases.	13	Cholera morbus.
14	Dropsy.	14	Dysentery.
15	Convulsions.	15	Typho-malarial Fever.
16	Diarrhea.	16	Whooping-cough.
17	Cancers.	17	Measles.
18	Scarlet Fever.	18	Pleuritis.
19	Kidney Diseases.	19	Cholera infantum.
20	Debility.	20	Diphtheria.
21	Measles.	21	Inflammation of bowels.
22	Spine Diseases.	22	Scarlet Fever.
23	Dysentery.	23	Typhoid Fever (enteric).
24	Rheumatism.	24	Puerperal Fever.
25	Whooping-cough.	25	Inflammation of brain.
26	Bronchitis.	26	Membranous croup.
27	Septicæmia.	27	Cerebro-spinal Meningitis.
28	Liver Diseases.	28	Small-pox.

It will be noticed that several diseases are mentioned as causing much sickness which do not occur in the list of diseases which cause death. That is to say, there are twenty-eight diseases from which more people die every year in Michigan than from some of the diseases which are shown to cause most sickness. By such a study it is made clear as to just what diseases shall claim the attention of the sanitarian.

Methods of Prevention.

It is probably well known that the efforts of health officers are all directed along the line of the prevention, and not at all to the cure of disease. That prevention is better than cure is true. These words were uttered by that wise philosopher John Locke two hundred years ago and are just as true today as then. The full quotation is "prevention is better than cure, and far cheaper."

Let it be insisted that the restriction and prevention of disease is a perfectly practicable matter. The literature of Sanitary Science abounds in illustrations of wonderful results in this direction. A few years ago certain persons in Montreal thought it would be a "wicked attempt to thwart the will of the Almighty" if they should employ vaccination as a preventive of small-pox, and as a consequence three thousand people died and many hundreds more were frightfully disfigured for life. On the other hand, in 1874 a law came into force in Prussia making vaccination and re-vaccination compulsory, and while previous to this law the mortality from small-pox per 100,000 of population had, only on six occasions in fifty-seven years, been as low as ten, it fell the very next year after the vaccination law of 1874 to 3.6. In 1877 the mortality was as low as .34 per 100,000. It had not up to 1882 reached a higher figure than 3.62 per 100,000 since this act was passed. Taken in connection with the fact that there was no such decline in Austria during this same period, this great lessening of the death rate of Prussia may properly be attributed to the vaccination law.

The history of typhoid fever epidemics in the city of Glasgow is another case in point. The fever death-rate in that city during the ten years, 1861-70, was 20.20 per 10,000 inhabitants, and during the next decade, 1871-80, owing to active sanitary work, was only 7.09 per 10,000. It should also be borne in mind that during the second decade the population went on increasing so that, but for the increased sanitary activity, the fever mortality of 20.20 ought, according to a well known law, to have increased somewhat during the next decade rather than to have fallen off two-thirds. The average annual death-rate from all causes during the decade, 1861-70, was 30.29 per 1,000, and during the second decade, 1871-80, was only 28 per 1,000. "This difference in the death-rate between these two decades means this, that 10,000 persons were alive at the end of 1880, who, if the death-rate had remained as in the first decade, would have been dead."

The particular method employed for the prevention of the spread of disease varies with the nature of the given disease and the circumstances surrounding the case. The principal watchwords of the reform are two, isolation and disinfection. Whenever any case appears which is suspected to be a communicable disease, the patient and nurse should at once be thoroughly isolated from all persons, those who may themselves be susceptible to the disease or who may be the means of communication between

the sick and the well. After this nothing must be allowed to pass from the sick room to that part of the house occupied by others without having been first disinfected by the proper means. This applies to air, water, food, dishes, clothing, books, papers, everything that has been within the limits of the sick room.

The details of the proper method of procedure for each case can not here be given but it may be repeated that explicit directions for all the most dangerous communicable diseases have been prepared by the State Board of Health and may be had on application to the secretary at Lansing, the principal function of that board being the collection and dissemination of information concerning all matters which are dangerous to the public health. It has collected a large amount of such informaton, published it in available form and for the asking any citizen in Michigan may have the benefit of it.

Co-operation is Necessary.

It must be remembered that the matter of prevention, the actual life-saving, cannot be brought about without the hearty coöperation of every person. When every one will intelligently inform himself as to the means to use; when all will yield willing compliance to the advice and directions of the legal authority, the health officer; whenever the information already in the possession of sanitarians shall be acted upon, epidemics will be stamped out, hundreds of useful lives will be saved to the State, and sorrow prevented which is indescribable and which cannot be computed.

And we do not need to go outside of our own State for proof that isolation and disinfection are effectual in restricting and preventing disease.

The system has been in operation for twenty years in Michigan and the results are well known. The two sets of mortality statistics, that collected by the State Board of Health and that collected by the Secretary of State, thoroughly agree on this point. As Dr. Baker has pointed out, "The State department statistics show that since this system has been in operation the mortality from scarlet fever in Michigan has been less than half what it was before. The statistics of the State Board of Health show that in those localities in which the methods of isolation and disinfection have been wholly enforced, the mortality from scarlet fever is not more than one-fifth what it was in those localities in which these measures have been neglected. So that while throughout the entire State one-half the mortality from scarlet fever has disappeared, there is opportunity for a continuance of the work until at least four-fifths of it shall have disappeared."

This brings us to a consideration of what is the real test of the efficacy of the work of the health officials of the State, viz., the amount of the actual saving of life.

Life Saving.

What of the results of the combined efforts of State Board, Local Boards, Physicians and people? Are lives saved? Are the extravagant claims true which are made by sanitarians that many lives are annually saved? Yes, these claims are true; of this there can be no doubt.

It is the glory of the health service in Michigan that we do not have to guess about it but that we are able to prove that annually many valuable lives are saved to the State that but for such service would meet an untimely death.

In a carefully-prepared paper, read before the Sanitary Convention at Vicksburg, Dr. Baker gave official statistics and evidence which he summarized as follows:

"The record of the great saving of human life and health in Michigan in recent years is one to which, it seems to me, the State and local boards of health in Michigan can justly 'point with pride.' It is a record of the saving of over one hundred lives per year from small-pox, four hundred lives per year saved from death by scarlet fever, and nearly six hundred lives per year saved from death by diphtheria—an aggregate of eleven hundred lives per year, or three lives per day saved from these three diseases! This is a record which we ask to have examined, and which we are willing to have compared with that of the man who 'made two blades of grass grow where only one grew before.'"

As I have already said, the report sent in by health officers state the number sick and dead from each outbreak and also in how many cases isolation and disinfection were neglected and in how many cases these means were enforced.

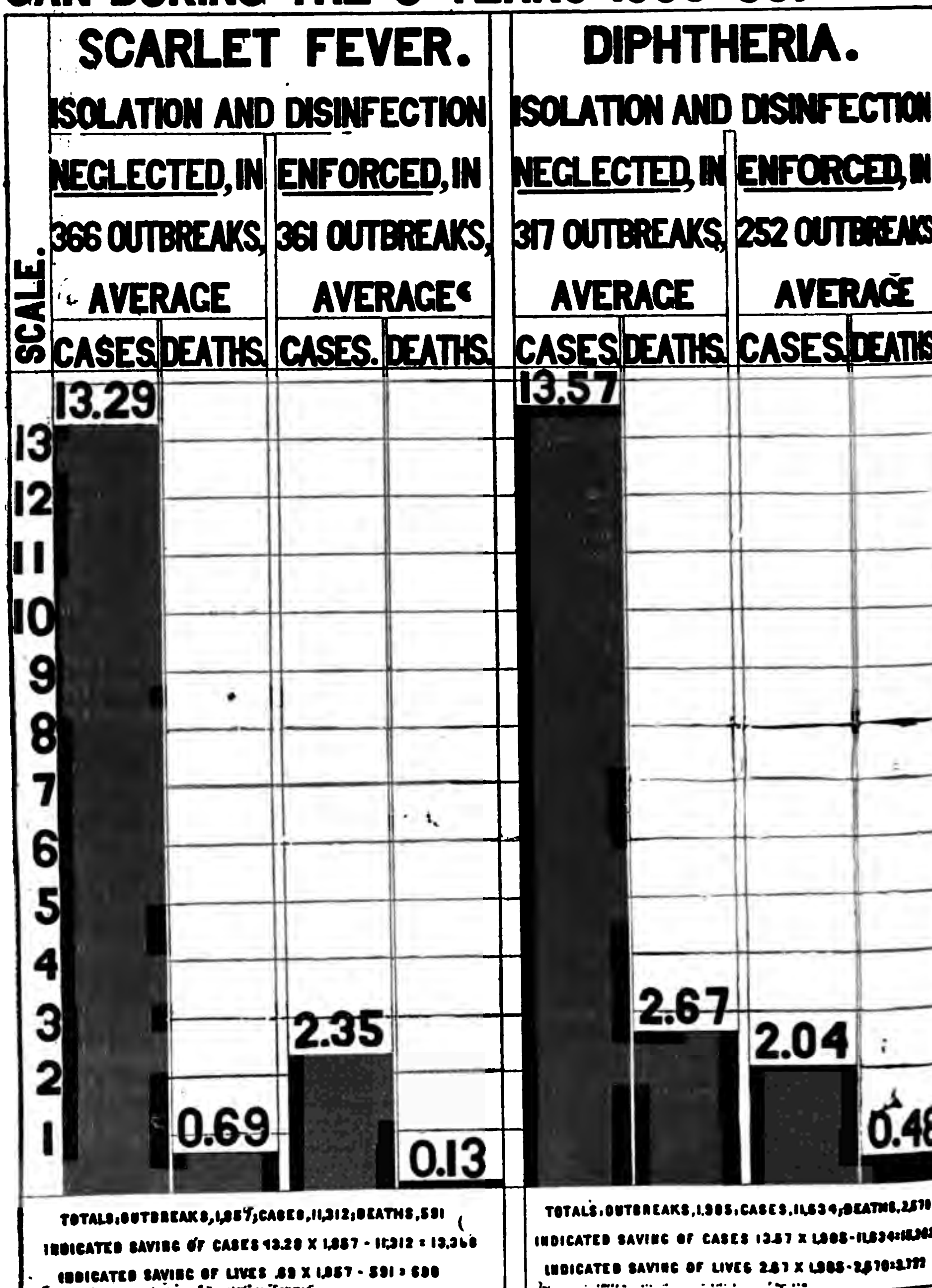
From these data the following diagram has been prepared containing an average of sickness and deaths per outbreak for scarlet fever. The report covers a period of five years. It will be seen that in 361 outbreaks the means of prevention were enforced and in 366 outbreaks these means were neglected. Now suppose that in all these outbreaks isolation and disinfection had been neglected; the total number of cases of sickness would have been $727 \times 13.29 = 9662$; and the number of deaths would have been $727 \times .69 = 502$. On the other hand if all had been done that could have been done, if all possible means had been employed, there would have been $727 \times 2.35 = 1,708$ cases of sickness and $727 \times .13 = 95$ deaths. The saving in sickness would have been $9,662 - 1,708 = 7,954$ cases and the saving of life would have been $502 - 95 = 407$.

But the whole number of outbreaks of this disease in Michigan during the five years was 1,857. Applying the same reasoning as before, first if isolation and disinfection were neglected in every case there would have been $1,857 \times 13.29 = 24,680$ cases of sickness and $1,857 \times .69 = 1,281$ deaths. If these means had been enforced, the number of cases which would have resulted would have been $1,857 \times 2.35 = 4,364$; and the number of deaths would have been $1,857 \times .13 = 241$. The total saving would have been $24,680 - 4,364 = 20,316$ cases of sickness and $1,281 - 241 = 1,040$ deaths.

Look at the same figures from the standpoint of the money lost to the State. A low estimate of the period of sickness for each case of scarlet fever would be to suppose it to be forty days duration on the average. 20,316 cases each sick forty days would make an aggregate sickness of $20,316 \times 40 = 812,640$ days. Suppose a physician visits these patients every other day at one dollar per visit. The doctor's bills would therefore be $812,640 \div 2 \times \$1.00 = \$406,320$. Suppose each case required a nurse at 50 cents per day. The nursing would cost $812,640 \times \$0.50 = \$406,320$. What is the value to the State of a life lost? The railroads by the decisions of courts and through their own action have paid $5,000 for a life lost through an accident on their road. Before the war, a good, likely slave was held to be worth $1,000. Let us take this lower figure which is probably much too low. Then the money value of those who died from scarlet fever, of those who ought not to have died, will be $1,040 \times \$1,000 = \$1,040,000$. Many

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

ISOLATION AND DISINFECTION RESTRICTED SCARLET FEVER AND DIPHTHERIA IN MICHIGAN DURING THE 5 YEARS 1886-90.



other expenses might legitimately be urged as growing out of these scarlet fever cases, but the recapitulation of these three items is very instructive, viz.:

Doctors' bills................	$406,320
Nurses' bills..................	406,320
Value of lives lost.............	1,040,000
Total......................	$1,852,640, or $370,528

every year from this one disease.

And it is to be urged that this is but a feeble way to measure the real loss, the fading out of the life of a beloved child, hopes blasted, happiness destroyed, suffering undergone, these cannot be estimated in dollars and cents.

It is also to be remembered that this is simply the saving from one of many diseases. The same diagram (on page 26) exhibits a saving of 2,722 lives from diphtheria in five years; and the diagram on page 21 shows a saving of 1,921 lives from small-pox in seventeen years, and 1,671 lives from typhoid fever in twelve years.

Work for the Future.

The good work is still going on, and its grandest achievements are still to be wrought out.

The State Board asks your coöperation in its boldest and most ambitious attempt at life saving. The great white plague of consumption numbers at least 2,000 victims in our State each year. Without entering into a discussion of this subject, which will be given the attention its importance deserves later in this convention, let me say that this is a preventable disease, and that if all consumptives could be induced to do what we know how to do, this disease, like small-pox and many other plagues and pestilences may be effectually stamped out. This will require the united and persistent coöperation of all the people and it is to be hoped that none of those who make up the audiences at this convention will fail to lend all the aid in their power to effect this grand end.

THIRD SESSION, FRIDAY, OCT. 26, AT 10:00 A. M.

SMALL-POX AND ITS RESTRICTION AND PREVENTION.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICH.

THE RESTRICTION OF SMALL-POX.

What should the Local Board of Health do on the Occurrence of Small-Pox?

Briefly, the three things to be done are: *isolate, vaccinate, disinfect.*

The local board of health should:

1. Completely isolate every person who is sick with small-pox or with varioloid.

2. Isolate all who have been exposed, or are believed to have been exposed to the disease, and release no one from isolation until the person

and clothing have been thoroughly disinfected, or are known to be free from infection.

3. Vaccinate every person exposed, with virus known to be good and active. If any such person refuses to be vaccinated, such person may be held in isolation until the close of the period of incubation,—fourteen days.

4. Every person exposed to small-pox should be under surveillance until the close of the period of incubation. And if any sickness similar to small-pox appears in such a person isolation should be enforced.

5. Offer free vaccination to all persons who have not been successfully vaccinated, or have not had the small-pox within the past five years, using bovine virus that is known to be fresh.

6. Publicly recommend vaccination and re-vaccination of all citizens not successfully vaccinated within the past five years.

7. Make and publish "Regulations," which shall publicly:

a. Declare every place where there is a case of small-pox or of varioloid to be a "hospital" under the law.

b. Forbid every person from approaching, entering, or departing from any such "hospital" except in accordance with "Rules and Regulations" made and published by the local board of health.

c. Forbid the removal of any article whatever from such a "hospital," without a permit from the board of health or health officer, and then only in accordance with regulations.

8. The local board should see that its health officer complies with its orders, regulations and with the laws.

9. The local board should see that the people generally comply with its regulations and the laws.

10. If necessary, the local board should employ guards to watch infected places. In order to do this, except under some local ordinance, it will probably be necessary first to make "regulations" which shall specify the duties of such guards, and refer to the penalty for resisting or disobeying the lawful orders of such guards.

11. After death or recovery from small-pox the health officer should disinfect every infected thing, and every thing liable to be infected.

What the health officer should do.

Act 137, Laws of 1883, specifies the duties of the health officer. It is as follows:

AN ACT *to specify certain duties of health officers and provide for compensation therefor, in townships, cities, and villages where the health officer is not otherwise instructed by the local board of health.*

SECTION 1. *The People of the State of Michigan enact,* That whenever the health officer of any township, city or village in this State shall receive reliable notice, or shall otherwise have good reason to believe that there is within the township, city or village of which he is the health officer, a case of small-pox, diphtheria, scarlet fever or other communicable disease dangerous to the public health, it shall be the duty of said health officer, unless he is or shall have been instructed by the board of health, of which he is an executive officer, to do otherwise,—

Immediately to investigate the subject, and in behalf of the board of health, of which he is an executive officer,—

To order the prompt and thorough isolation of those sick or infected with such disease, so long as there is danger of their communicating the disease to other persons;—

To order the prompt vaccination or isolation of persons who have been exposed to small-pox.

To see that no person suffers for lack of nurses or other necessaries because of isolation for the public good;

To give public notice of infected places* by placard on the premises, and otherwise if necessary.

To promptly notify teachers or superintendents of schools concerning families in which are contagious diseases;

To supervise funerals of persons dead from scarlet fever, diphtheria, small-pox, or other communicable disease which endangers the public health;—

To disinfect rooms, clothing and premises, and all articles likely to be infected before allowing their use by persons other than those in isolation.†

To keep the President of his own board of health, and the Secretary of the State Board of Health constantly informed respecting every outbreak of a disease dangerous to the public health, and of the facts so far as the same shall come to his knowledge, respecting sources of danger of any such diseased person or infected article being brought into or taken out of the township, city, or village of which he is the health officer.

SEC. 2. In the absence of regulations conflicting therewith, made and published by the local board of health, and still remaining in force, the provisions of section one of this act shall have the force of regulations made and published by the local board of health; and whoever shall knowingly violate the provisions of section one of this act, or the orders of the health officer made in accordance therewith, shall be deemed guilty of a misdemeanor, and upon conviction thereof he shall be punished by a fine not exceeding one hundred dollars, and the costs of prosecution, or in default of payment thereof, by imprisonment not exceeding ninety days in the county jail, in the discretion of the court. ‡

SEC. 3. In the fulfillment of the requirements of this act, the health officer, unless other provisions shall have been made in accordance with law, shall be entitled to receive from the township, city or village of which he is health officer, compensation at the rate of not less than two (2) dollars per day: *Provided*, That this section shall not be construed to conflict with any action of the local board of health, under section sixteen hundred and ninety-three, of the compiled laws of eighteen hundred and seventy-one, as amended by act number two hundred and two, of the laws of eighteen hundred and eighty-one.

City Communicable-Disease Inspectors.

The theory of the law in Michigan is that every case of dangerous communicable disease is to be reported to the health authorities. This is required of every physician, under penalties, and of every householder unless notice has already been given by the physician.

However, Act 137, Laws of 1883, makes it the duty of every local health officer, unless he shall have been otherwise directed by the board of health of which he is executive officer, to investigate whenever *he shall have reason to believe* that any dangerous communicable disease is present in his jurisdiction.

In townships, villages, and small cities it is practicable for the health officer to do this; and in framing that law it was considered that in large cities if necessary the health officer could be "instructed by the board of health of which he is an executive officer to do otherwise." It is plain that in cities of the size of Grand Rapids, and especially of Detroit, the entire time of at least one person might be demanded in order to comply with that requirement, even concerning only those cases in which the sus-

*Required also of the board of health, by § 1673 Howell's statutes, as follows:

(1732.) SEC. 41. When the small-pox, *or any other disease dangerous to the public health*, is found to exist in any township, *the board of health shall use all possible care to prevent the spreading of the infection*, and to *give public notice of infected places* to travelers, by such means as in their judgment shall be most effectual for the common safety. § 1673. Notice of infected places.

†This law requires the health officer to disinfect, which implies that the board of health (and not the householder or attending physician) must supply the disinfectants. The disinfection is for the public safety, and the quantity of disinfectants should be ample, and the methods should be under the immediate supervision of the health officer as the law requires. For methods of disinfection see pamphlets entitled "Restriction and Prevention of Diphtheria," and "Restriction and Prevention of Scarlet Fever," issued by this Board, and which may be had by application to the Secretary of the Board at Lansing.

‡ As amended by act approved March 28, 1889.

pected disease is not distinctly reported. A very few physicians, by reporting "suspected" cases, might easily keep a health officer employed all of his time investigating such cases, leaving him no time whatever for the discharge of other official duties.

The proper course would seem to be for the board of health in every large city to have "Contagious-Disease Inspectors." And these should be selected with reference to their expert ability as diagnosticians of the dangerous communicable diseases.

What are the diseases which are most dangerous and most common, and in the diagnosis of which, therefore, such an inspector should be an expert?

In Michigan these diseases, in the order of their importance *in this regard*, are about as follows:

Diphtheria, scarlet fever, small-pox, consumption.

Probably the diagnosis of consumption is of more importance than small-pox, but from habit I have written small-pox first. As a cause of deaths in Michigan small-pox has recently been of small consequence, because it is about the easiest disease to restrict that the health officer has to deal with; and there is no excuse for an intelligent person having the disease, because by vaccination and re-vaccination any person may protect himself. But for the protection of the ignorant, improvident and imprudent portions of our inhabitants, and the pecuniary interests of those liable to suffer through such inferior classes of persons, small-pox must be restricted.

A Contagious-Disease Inspector is a person who should be restricted in his intercourse with the public, except after extraordinary-painstaking care to disinfect himself and his clothing. A health officer of a large city has many duties to perform which bring him into contact with the people. He cannot properly perform the duties of health officer and also of a Contagious-Disease Inspector. The qualifications for the two classes of duties are not the same. A physician may be quite willing and competent to serve as a health officer or health commissioner of a city, but incompetent or unwilling to serve as a Contagious-Disease Inspector. And the converse of this statement also is true.

Every large city should recognize these facts, and act accordingly.

In the city of Detroit there are reported in every week cases of each of several dangerous diseases, sometimes a large number, as, for instance, in the week ending May 5, thirteen new cases of diphtheria and thirty-five new cases of scarlet fever.* Every one of these forty-eight cases should have been, and I suppose was, visited by a Contagious-Disease Inspector. Directions relative to isolation were required. Guards to ensure isolation were needed in some instances. It is manifestly impossible for one person to properly attend so many cases of different diseases, scattered about in a large city, where care must be taken to avoid exposing people to the infection from the person or clothing of the inspector, and especially where the disease is diphtheria or some other disease for which there is no known protection by vaccination.

In a large city there should always be at least one inspector especially expert with reference to diphtheria, and one with reference to scarlet fever. When occasion requires, there should also be one who is an expert on questions relating to small-pox.

---

* The weekly report was as follows:—See bottom of next page.

Few of the younger physicians in Michigan have ever seen a case of small-pox. Whenever it appears in a locality, it is commonly the case that it is not recognized. In every suspicious case, however, the public safety should be given the benefit of the doubt.

It is as improper for the Secretary of the State Board of Health to act as a Contagious-Disease Inspector, as it is for the health officer of a large city to do so. If he serves in such a capacity he must neglect his duties as Secretary of the State Board of Health. It is plain that the public interests would be better served if the State had at least two and occasionally three "Communicable-Disease Inspectors"—one for diphtheria, one for scarlet fever, and one for small-pox—to be employed when required. In times past an appropriation for that purpose has been asked of the legislature but it has not yet been so ordered. If you agree with me that it would be for the public interest to do so, you might memorialize the legislature to this effect and see to it that your own representative and senator have the subject brought to their attention.

THE PREVENTION OF SMALL-POX.

What people generally should do.

Small-pox may be prevented. If vaccination is properly performed, with active virus, and sufficiently often, small-pox does not occur. This is a very important fact. It is possible, therefore, for every person to protect himself or herself, without the aid of any health officer or board of health. If people do not thus protect themselves it is because they are ignorant or careless.

It ought not to be true that there is still much ignorance of the value and safety of the operation of vaccination. But the recent occurrence of small-pox demonstrates that there is still either much ignorance or much carelessness.

"*To the Secretary of the State Board of Health, Lansing, Michigan:*

"SIR—The following is a report of all known cases of the diseases named below in the City of Detroit, County of Wayne, State of Michigan, during and at the close of the week ending Saturday, May 5, 1894:

Names of Diseases.	How many sick at close of last week?	During this Week.					How many sick at close of this week?	Remarks.
		How many moved in?	How many taken sick?	How many moved out?	How many recovered?	How many died?		
Diphtheria.......	18	....	13	....	4	1	26	....
Scarlet Fever....	51	....	35	....	4	0	82	....
Small-pox	....	....	....	....	....	....	....	....
Typhoid Fever...	11	....	0	....	0	0	11	....

D. McLEOD, M. D.,
Health Commissioner.

Detroit, Mich., May 19.

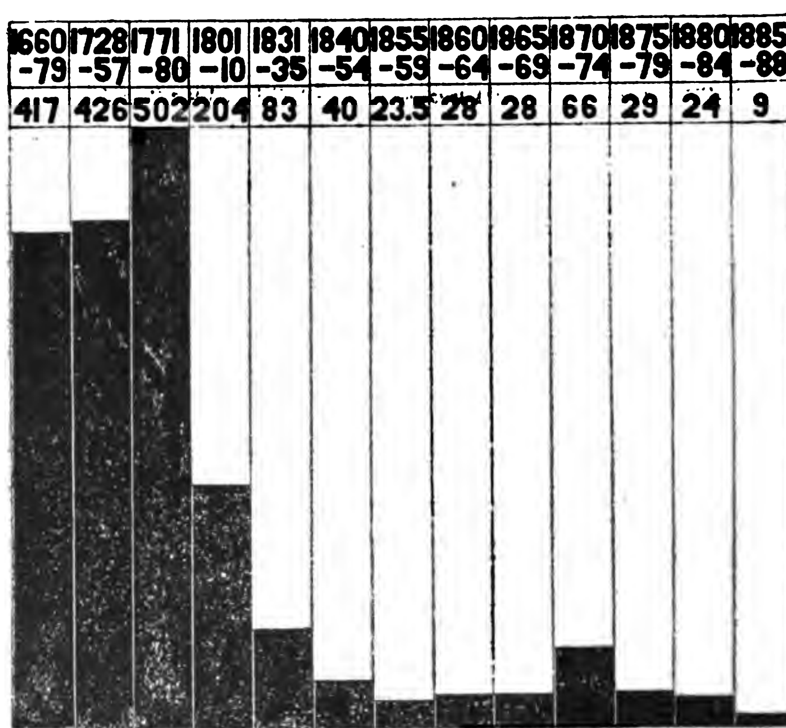
In order to appeal to those who do not yet sufficiently appreciate the importance of vaccination, I submit herewith some notes on this subject.

The Benefits of Vaccination.

From 1660 to 1780, preceding the introduction of vaccination in London, the average annual number of deaths reported from small-pox in that city was 44 per 10,000 persons living; while from 1801 to 1888, since the introduction of vaccination, it was only 6.5;—that is, there were about seven times more deaths from small-pox before than since the introduction of vaccination. In Sweden during the 28 years, 1774-1801, preceding the introduction of vaccination, the average annual number of deaths from small-pox per 10,000 persons living was 21; while during the 41-year period, 1810-1850, since the introduction of vaccination, it was only 1.6;—that is, there were proportionally over thirteen times more deaths from small-pox before than since the introduction of vaccination.* I submit diagrams graphically illustrating these facts. (They are printed on pages 34, 35 and 36.)

NO. 4.

ANNUAL DEATHS IN LONDON BY SMALL-POX PER 100,000 POPULATION.



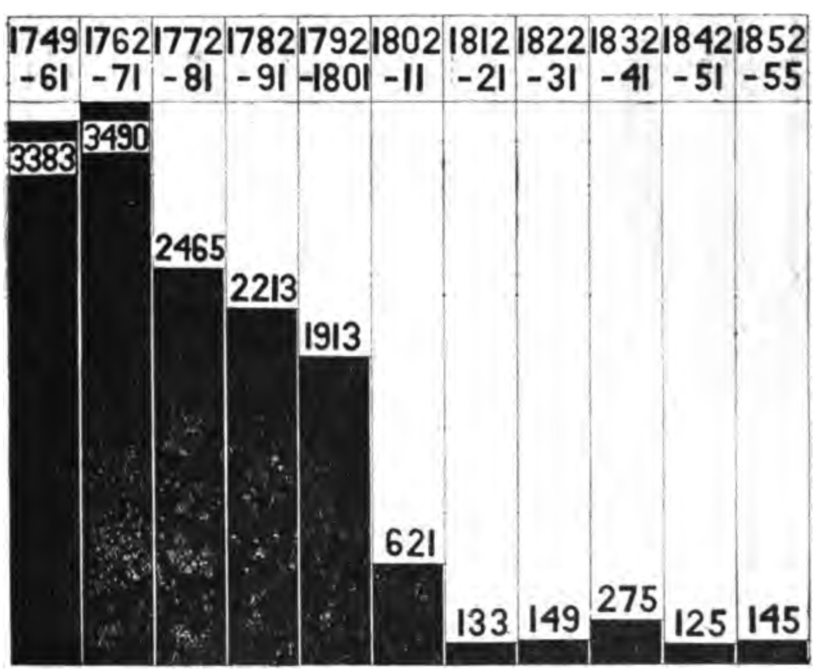
* Foot note on opposite page.

Vaccination had been introduced into Michigan so that during the period from 1869 to 1873, preceding the establishment of the State Board of Health, there were only 0.85 of one death from small-pox per 10,000 persons living. Since 1873 the Michigan State Board of Health has kept up a campaign of education concerning the value of vaccination, and the best methods for the restriction of small-pox, and during the seventeen years, 1874-90, the average annual number of deaths from small-pox in Michigan was only 0.16 of one per 10,000 persons living,—that is, there were over five times more deaths from small-pox before than since the board was established. (A diagram exhibiting this, is printed on page 21.)

The average number of deaths from all causes per 10,000 persons living in the city of London during the period from 1620 to 1780, just preceding the introduction of vaccination, was 64 (63.57); while during the period from 1801 to 1888, since the introduction of vaccination, it was only 26 (25.65),—that is, there were proportionally about two and a half times more deaths from all causes before than since the introduction of vaccination.* (This is graphically shown by Diagram No. 7, page 37.)

NO. 5.

ANNUAL DEATHS IN SWEDEN BY SMALL-POX PER 1,000,000 POPULATION.

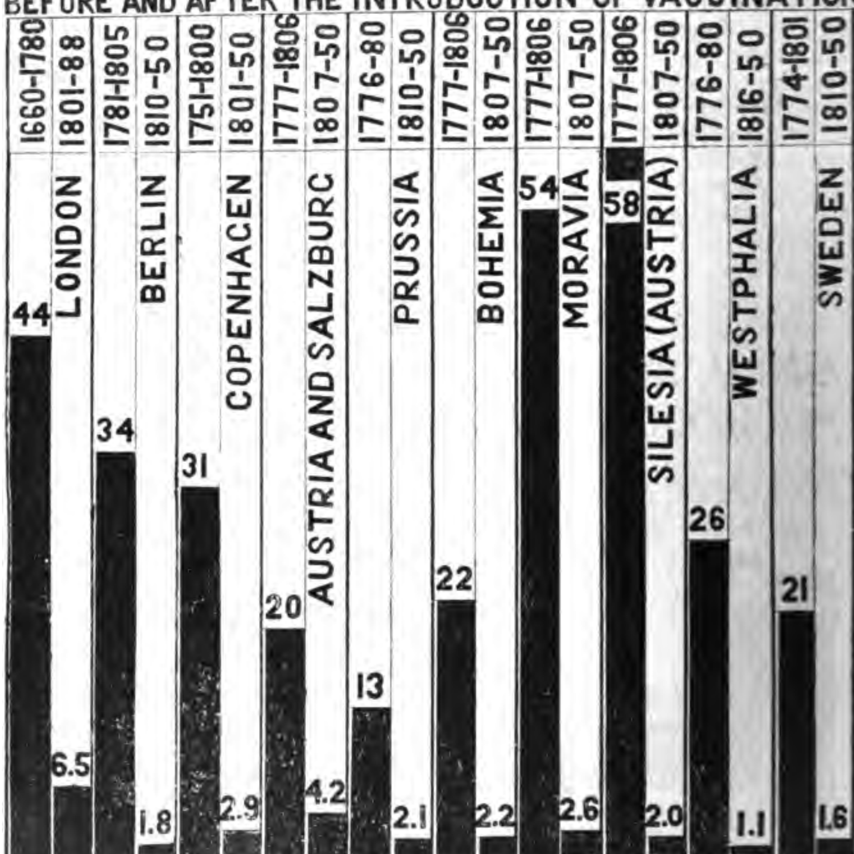


* Data obtained from Tables 6 and 7 of "Achievements of Sanitation Measured by Vital Statistics." By George E. Willitts.

NO. 6.

ANNUAL DEATHS BY SMALL-POX PER 10000 POPULATION

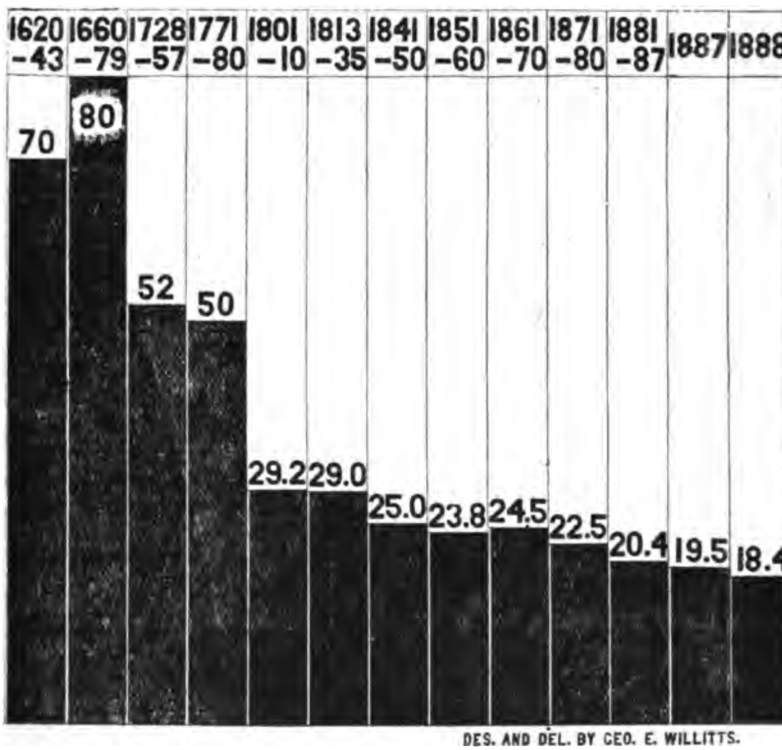
BEFORE AND AFTER THE INTRODUCTION OF VACCINATION



DES. AND DEL. BY GEO. E. WILLITTS.

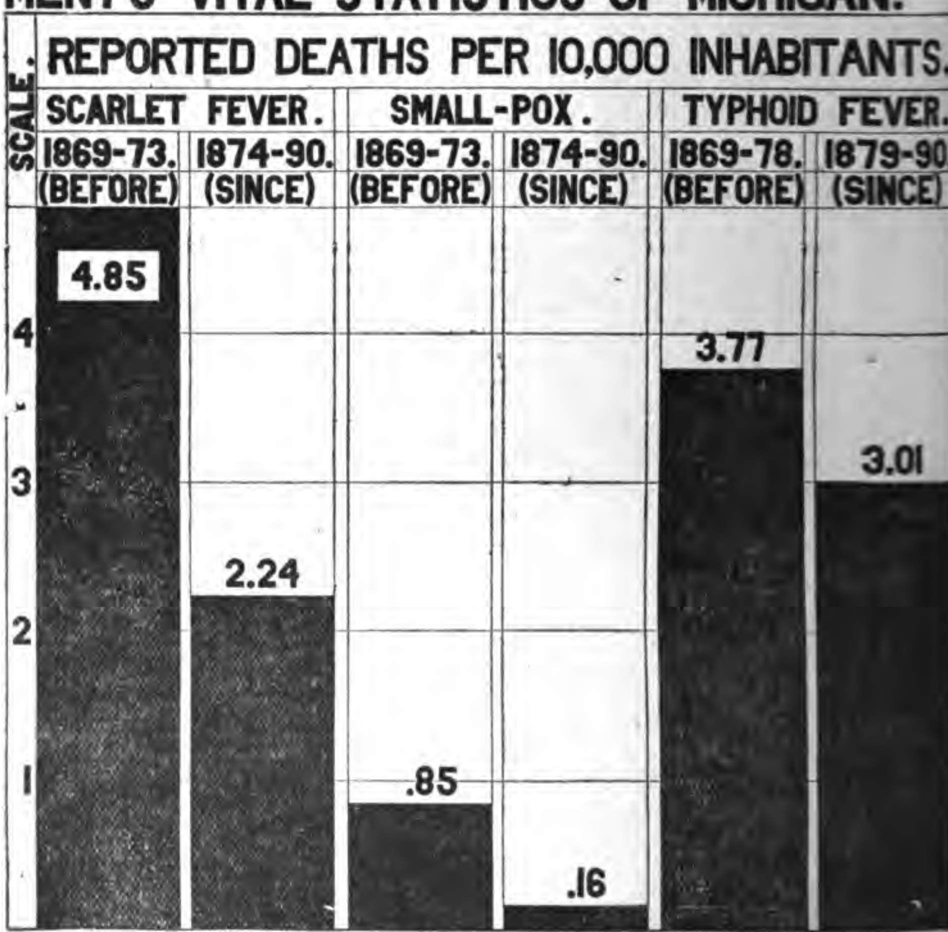
NO. 7.

DEATHS IN LONDON FROM ALL CAUSES PER 1000 POPULATION PER ANNUM IN PERIODS REPRESENTING THE 17th 18th AND 19th CENTURIES.



MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

LIVES SAVED BY PUBLIC-HEALTH WORK. COMPARISON OF DEATH-RATES IN MICHIGAN FROM SCARLET FEVER AND SMALL-POX BEFORE AND SINCE THE STATE BOARD OF HEALTH WAS ESTABLISHED AND FROM TYPHOID FEVER BEFORE AND SINCE ITS RESTRICTION WAS UNDERTAKEN BY THE STATE BOARD. COMPILED FROM STATE DEPARTMENT'S "VITAL STATISTICS" OF MICHIGAN.



LIVES SAVED FROM: SCARLET FEVER (17 YEARS) 7,265; SMALL-POX (17 YEARS) 1,821; TYPHOID FEVER (12 YEARS) 1,871.

In a paper read before the Pan-American Medical Congress in Washington, September, 1893,* William M. Welch, M. D., gave a statistical record of 5,000 cases of small-pox, being those under his observation during 23 years, 1870-1893, in the Philadelphia Municipal Hospital for Infectious Diseases. He mentions causes of unusually high death-rates, but this does not affect the comparisons of death-rates of the vaccinated and unvaccinated. These were: Vaccinated, 16.26; unvaccinated, 58.38 per cent. Here the "vaccinated" includes all "vaccinated in infancy" having "good," "fair" and "poor" cicatrices.

Relative to the influence of multiple insertions of vaccine virus Dr. Welch's experience is not quite the same as some others. He says:

"It is, indeed, in striking contrast with the evidence on this point collected by Mr. Marson and tabulated by Mr. Simon. According to these authors, who derived their data from 6,000 post-vaccinal cases of small-pox, the mortality-rate among patients having one vaccine scar was 7.5 per cent; having two, 4.125 per cent; having three, 1.75 per cent; having four or more, 0.75 per cent. Where the vaccine scars were all well marked or typical, the loss by death is said to have been even less than is here indicated." * * * *

"Referring again to the table, it is seen that where the vaccine scars are typical there is no relation between the number of such scars and the degree of protection conferred against small-pox. Indeed, it so happens in the table that the death-rate among the patients having but one 'good' mark is a little lower than among those having four or more 'good' marks. There is no doubt that vaccinia characterized by a single typical vesicle destroys in the individual all susceptibility to small-pox, and it would be impossible for multiple vesicles to do more than that. As a safeguard against failure, however, or when using long-humanized virus, it is advisable to make several insertions; but I must repeat that it is my positive conviction that the quality of vaccine lymph has far more to do with securing efficient vaccination than multiple insertions have."

Dr. Welch says: "Also, I have seen over and over again entire families brought into the hospital when all the unvaccinated children have been suffering from small-pox, and the vaccinated children unaffected; have seen the former perish, and the latter remain exempt from the disease, although living, eating and sleeping in the infected atmosphere for several weeks. But I have yet to see a single unvaccinted child escape the disease under similar circumstances. Furthermore, I have more than once seen a vaccinated infant draw its daily supply of nourishment from a mother suffering from varioloid, and the infant remain as free from any symptom of the disease as if the infection were a thousand miles away and the food were received from a most wholesome source. All this is evidence of the prophylactic power of vaccination that cannot be shown in mortality tables."† * * * * *

"The table also shows that vaccination practiced after exposure to the infection of small-pox may afford considerable protection against the disease. If it be performed within two or three days after the infection has been received into the system it is possible for the protection to be absolute. I have seen as many as twenty-eight children perfectly protected

* N. Y. Medical Journal, March 17 and 24, 1894.
† N. Y. Med. Jour., Mar. 17, 1894, p. 328.

from small-pox by vaccination during the incubation period.* But if the vaccination be performed much less than seven days before the eruption of small-pox appears, no modifying influence will be exerted.†

"In a considerable number of the cases included in the table under the head of 'vaccinated seven days and less prior to the appearance of the variolous eruption' the patients had been vaccinated no longer than from two to four days before the eruption appeared, while a somewhat larger number had been vaccinated as long as from four to seven days before it appeared. Taking the whole number of cases under this head, it is seen that the death-rate is 43.86 per cent, while among the unvaccinated it is as high as 58.18 per cent. This shows that considerable protective influence must have been exerted by vaccination performed during that period. But a still greater influence was exerted among the cases included under the succeeding head, where vaccination is represented as having been performed longer than seven days before the small-pox eruption appeared. The death-rate here is only 20.27 per cent."‡

Dr. Warlemont, of Brussels, has said "Out of more than 10,000 children vaccinated at Brussels with animal lymph, from 1865 to 1870, and who went through the terrible epidemic of small-pox which in 1870 and 1871 frightened the world, not a single one was, to my knowledge, reported as being attacked by the disease. The same immunity was shared by those—a much larger number—whom I had re-vaccinated, and who at the same time were living in epidemic centers."§

During 42 years of duty, Dr. Marson, physician of the London Small-pox Hospital, has never observed a single case of small-pox in the officers and employés of the hospital, who are re-vaccinated, when they enter the service, and who are constantly exposed to the infection.

Dr. Welch says: "The more positive evidence of the efficacy of re-vaccination is to be found in the fact that persons recently re-vaccinated with effect do not take small-pox when freely exposed to the infection. During my service of 23 years no resident physician of the hospital, no nurse, laundress, cook, or any other employé who was properly re-vaccinated before entering on duty has taken the small-pox. Perhaps I should except a female nurse who was re-vaccinated on the first day of her residence in the hospital with almost typical result. In the course of about two weeks I noticed on the forehead of this nurse, near the edge of her hair, one or two variolous vesicles, which were preceded by but little if any febrile disturbance. At any rate, she was at no time disabled from performing her usual duties.

"What vaccination has done for these employés, whose duties have necessarily brought them in the closest possible contact with the infection of small-pox, it will do for any or all who fully avail themselves of its protective influence. I am firmly of the opinion that if all persons were properly vaccinated in infancy and again at the age of puberty, Jenner's prediction, as to the power of this agent to extirpate small-pox from the globe, would soon be realized."||

---

* For further information on this subject see my paper on Vaccination during the Incubation Period of Variola, published in the *Transactions of the Ninth International Medical Congress*, Vol. iv., p. 160.
† N. Y. Med. Jour. Mar. 17, 1894, p. 329.
‡ N. Y. Med. Jour., Mar. 17, p. 329.
§ North Carolina Medical Journal, January, 1880, Vol. v., p. 2.
|| N. Y. Medical Journal, March 24, 1894, p. 362.

Has Vaccination lessened other diseases besides Small-pox?

Recently* I have pointed out the fact that the restriction of small-pox is strongly in harmony with the law of the "Survival of the fittest,"—that by its restriction nearly the entire human race has been made much more fit to survive and perform all the functions of a healthful existence. Before the era of vaccination it was said of small-pox: "Among those who outlive it, many either totally or partially lose their sight or hearing; many are left consumptive, weakly, sickly or maimed."† I wish to ask attention to an indirect corroboration of this statement by the mortality statistics of London, England, before and since the era of vaccination.

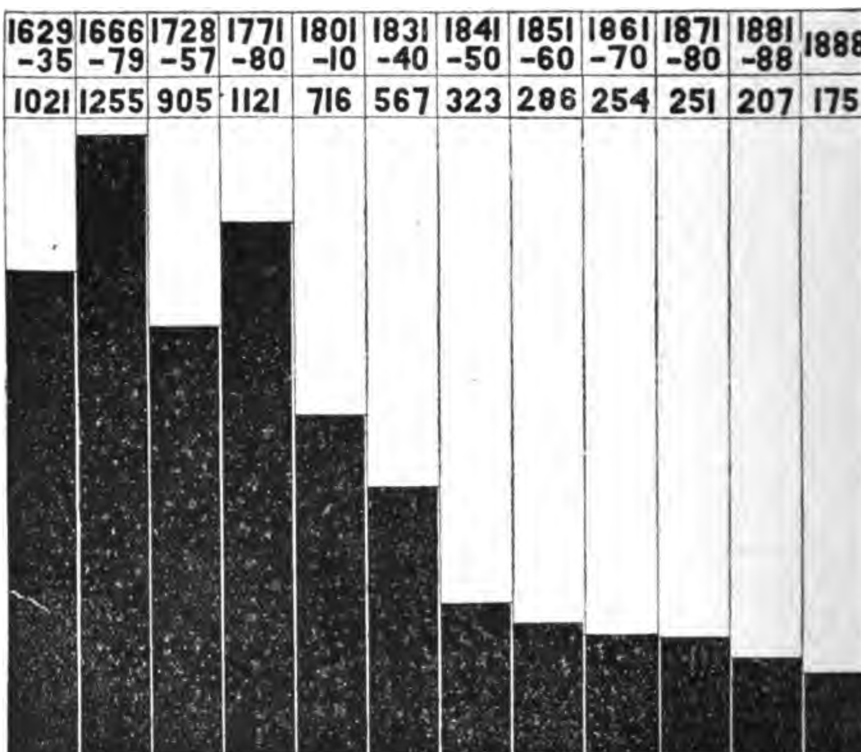
I have here a few diagrams No. 4 exhibits the annual mortality in London by small-pox by periods of years from the year 1660 to the year 1888, from which it appears that the mortality was very much less from and after the introduction of vaccination, about the year 1800. Diagram No. 3 (page 42), exhibits the mortality in London by consumption, and it is readily seen that the reduction in consumption was great, although not as great as was the reduction of small-pox. Probably not all the reduction of consumption was due to the lessening of small-pox, but it is reasonable to believe that the extremely great reduction in small-pox lessened greatly the numbers which LaCondamine had said were left "consumptive" by reason of having had the small-pox.

We now know that consumption is contracted easily through breaks in the skin or membranes exposed to the bacilli. We know that small-pox makes many such breaks. Previous to vaccination nearly every person had small-pox. Perhaps no other one cause capable of so greatly lessening consumption is known to have been present and acting in London from and after the time of the introduction of vaccination as was vaccination itself including the actual lessening of small-pox and consequently those made consumptive by small-pox.

---

* Before the State Med. Soc. at Lansing, May, 1894.
† La Condamine.

NO. 3.
ANNUAL DEATHS IN LONDON BY CONSUMPTION PER 100,000 POPULATION.



DES. AND DEL. BY GEO. E. WILLITTS.

Vaccination should be done by a competent physician.

The operation of vaccination should be performed always by a competent and careful physician, or by some one whom he has instructed and recommends to perform the operation. It is an important operation, because so much is involved if when reliance is placed in its result it is found not protective. It then involves the risk to life itself. A well-educated and experienced physician has the skill and the special knowledge necessary to the best judgment on all the questions involved, as to the best and safest way to vaccinate, and as to the success of the vaccination. To judge of the success of the vaccination, examination should always be made by the physician, one week after the day of the operation; or if it is a re-vaccination it is well to have an examination before the eighth day.

The necessity for aseptic surroundings.

Since the germ theory of disease is so well established, and especially since so many of the most important diseases, and many diseases not formerly attributed to germs, are now known to be caused by organisms microscopic in size and capable of floating as dust in the atmosphere of inhabited rooms, the importance of having vaccination done by a physician who understands all about the germs of disease is much more apparent than it was in former times. And, although vaccination has been done hundreds of times with any needle or pin which was convenient, and generally with no bad result, yet it is now possible for the skillful physician or surgeon, with his sterilized needle or lancet, with the use of water that has just been boiled and cooled, and where no person is permitted to shake out a handkerchief with its innumerable germs of several diseases, and in a room comparatively free from dust and germs, to have vaccination yield typical results, and no disease or trouble to be experienced. The conditions I have just mentioned are not all which the careful physician may enforce; he may have the arm carefully washed and even bathed with a disinfectant and that washed off with sterilized water, and after vaccination the arm protected by a cloth sterilized by boiling and afterwards being ironed on both sides with a hot flat-iron. But I am trying to give you only an idea of the intelligent care which it is now possible to give to what was once considered a trivial operation, and what it must be admitted is generally free from danger, yet which is sometimes charged with being the cause of painful and troublesome arms. By such means as I have suggested, I think it is now possible to guard against and prevent any bad result from vaccination.

APPENDIX.

Office of the Secretary of the Michigan State Board of Health,
Lansing, Mich., Oct. 24, 1894.

The following is a statement relative to all small-pox known in Michigan, since January 1, 1894:

Counties.	City, Village or Township.	Date of Outbreak.	Cases. Total.	Died.	Recovered.	Still sick.	Houses infected.	Houses now infected.
Allegan	Otsego Tp.	Jan. 9	2	1	1	0	2	0
Allegan	Otsego Vil.	Jan. 24	4	1	3	0	2	0
Menominee	Menominee	Jan. 27	6	3	3	0	4	0
Iron	Crystal Falls	Feb. 13	1	0	1	0	1	0 *
Marquette	Ishpeming	Mar. 13	2	0	2	0	1	0
Kalamazoo	Kalamazoo	Mar. 24	2	0	2	0	1	0
Jackson	Jackson	Apr. 27	4	2	2	0	2	0
Marquette	Marquette	May 3	1	0	1	0	1	0
Muskegon	Muskegon	May 6	3	1	2	0	1	0
Bay	Bay City	May 7	5	1	4	0	1	0
St. Joseph	Sturgis	May 11	5	4	1	0	1	0
Kent	Grand Rapids	May 16	1	0	1	0	1	0
Wayne	Detroit	May 23	2	0	2	0	1	0 *
Wayne	Detroit	May	78	13	50	15	28 ?	6 ?
Kent	Grand Rapids	June 11	1	0	1	0	1	0
Monroe	Frenchtown Tp.	June 16	3	1	2	0	2	0 *
Oakland	Farmington Tp.	June 18	1	1	0	0	1	0
Oakland	Pontiac	June 19	2	0	2	0	1	0
Bay	Bay City	June 19	1	1	0	0	1	0
Monroe	Berlin Tp.	June 20	2	1	1	0	2	0 *
Washtenaw	Ypsilanti	June 20	1	0	1	0	1	0
Kent	Grand Rapids	June 20	1	0	1	0	1	0
Macomb	Macomb Tp.	June 20	5	0	5	0	1	0
St. Joseph	Sturgis	June 21	5	0	5	0	3	0
Kent	Grand Rapids	June 22	1	0	1	0	1	0
Genesee	Clayton Tp.	June 23	2	0	2	0	1	0
Jackson	Rives Tp.	Sept. 22	1	0	0	1	1	1
Washtenaw	Manchester Tp.	Oct. 8	17	0	0	17	?	?
Jackson	Norvell Tp.	Oct. 20	1	0	0	1	1	1
State (twenty-nine outbreaks at twenty-three places)			160	30	94	36	66 ?	9 ?
Average to an outbreak			5.5	1	-------	-------	2.3 ?	-------

* No final report from locality.

In the 29 outbreaks there have been on the average to each outbreak 5.5 cases and 1 death. In 18 of the 25 outbreaks now over the infection was restricted to the one house in which it first occurred.

Small-pox is still present in four places,—Detroit, Rives Tp., Manchester Tp., and Norvell Tp.

Very respectfully,

HENRY B. BAKER,

Secretary.

DISCUSSION.

BY HON. FRANK WELLS, PRESIDENT OF STATE BOARD OF HEALTH, LANSING.

It seems to me that it will be well to impress upon the minds of the people of this convention the fact that though diphtheria and small-pox are cold-weather diseases, yet in Chicago, Detroit and many other places both these diseases have been spreading during the warm weather of the present summer.

Everything in our power should be done to exterminate these diseases. Isolation, disinfection and vaccination are the means by which this may be accomplished.

Render your town free from all danger from small-pox by vaccination and re-vaccination without waiting for the disease to first make its appearance in your midst. Do your share towards making this method of prevention universal for this loathsome disease can by this means, and by this only, be exterminated.

This was the time during the Convention that Dr. D. H. Wood, M. D., Coldwater, should have read a paper on "Alcohol and Narcotics;" but a telegram from Dr. Wood announced his inability to be present. Prof. McIntosh was called upon to address the Convention on the following named subject:

ALCOHOL AND NARCOTICS.

REMARKS BY PROF. H. W. MC INTOSH, SUPT. OF SCHOOLS, UNION CITY.

(Reporter's abstract.)

I had no idea of making a speech when I came up here. We began school this morning at 8 o'clock in order to close early enough to come up and hear this discussion, and no doubt some if not all will be greatly disappointed. Nevertheless, I am here and when I am through talking, I hope you will pardon me if I have not touched the key you wished me to.

If you will go with me to the schoolroom you will readily see the effects of alcohol and narcotics on the system, for we have, I am sorry to say, boys in our school who use one and perhaps both of these, and as I look over the audience I do not see one of them present.

The boy who smokes cigarettes or chews tobacco is the one who is stupid and *always* behind in his classes. I could name for you today boys who buy cigarettes.

When this filthy weed is taken into the mouth, certainly some of it is swallowed with the saliva, and is taken into the stomach and is carried through the whole system. This affects the growing tissue of the brain, and makes it unfit for good active work, and the result is that they who use it fail in their recitation.

We sometimes hear the man of forty say: "I have used tobacco all my life, and it never hurt me; I am just as hale and hearty as ever." Yet compare this man with one who has not used tobacco all his life.

Certainly the brain after being affected by alcohol is not one-half as fit for work as it was before.

Investigation has shown that alcohol and narcotics are injurious, then let us impress this fact forcibly upon the minds of the small children in our school-rooms.

ALCOHOL AND NARCOTICS.

DISCUSSION OF THE SUBJECT, BY HON. J. J. WOODMAN, MEMBER STATE LIVE STOCK COMMISSION, PAW PAW.

(Reporter's abstract.)

I do not know that I have anything to say on this subject, although it is of great importance. I think a good many truths have been uttered. I cannot say from personal experience that these are injurious, for I never used alcoholic liquor or tobacco, and I am proud to make the assertion, yet observation has taught me that they are injurious, and I do not believe anything but the *law*, can stop this terrible traffic in alcoholic beverages.

While in a very pretty town not a great while ago, a gentleman was showing me the principal places and streets. We came to the town hall that had just been built: "This" he said, "was built with the money paid to the city by the saloon men." I said it was a beautiful structure, but it would seem more complete to me if in large letters at the top in front were these words: "Built from money which has been taken to reduce the people to crime and poverty."

Oh! that we could uproot this awful evil, get the saloon out of our midst! Ignore the saloon keepers and bar-tenders, make them unpopular, do not take them into your high class society, just because they have money. Again I say ignore them. Do not allow your children to taste the nasty stuff, discourage the use of it in every way, and the result will be more happy homes and a better class of poeple.

ALCOHOL AND NARCOTICS.

DISCUSSION BY PROF. DELOS FALL, M. S., MEMBER STATE BOARD OF HEALTH, ALBION.

(Reporter's abstract.)

The question of alcohol and narcotics is one of very great importance. It should be preached from our pulpits, taught in our day schools, and no opportunity should be lost to show the evil which results from the use of alcohol and narcotics. Homes have been broken up, crime of every description has been committed, and in many cases we trace the crime to the effect of some form of alcohol.

We have all seen it demonstrated and it is of no use for me to take up valuable time by relating any of these instances, but I do wish more especially to warn the young men in the audience, against forming the habit of using either alcohol or narcotics.

Do not be fooled my boy by the old tobacco user who says he is as hale and hearty as anyone who never used the ugly stuff, for he is not. You

will find him nervous, and not one-half the man he would have been had he let it alone. You can tell the habitual cigarette smoker as far as you can see him, just as well as the habitual drunkard.

If you do not see the effect of it at once, you will in after years of life.

FOURTH SESSION, FRIDAY, OCT. 26, AT 2:30 P. M.

THE MILK SUPPLY OF A CITY, IN THE LIGHT OF MODERN BACTERIOLOGICAL RESEARCH.

BY JOHN H. KELLOGG, M. D., BATTLE CREEK.

The milk supply of a city is, from a sanitary or public-health standpoint, a matter of the highest importance. In fact, of the many questions which come before the health officer or the sanitarian for consideration and study, none are of greater importance than those which pertain to the milk-supply, with the exception of those relating to air and water supply. I think the truth of this statement will not be questioned when it is remembered:

1. That milk in some form, as milk, butter, or cheese, is almost universally employed as an article of food among civilized people; and

2 That modern bacteriological study has shown that milk is one of the most common and efficient means by which disease germs may be communicated to the human body.

A number of common and very fatal maladies have been traced to the use of impure milk. Omitting maladies concerning which authorities are still somewhat in doubt, the following may be mentioned as those concerning which the fact of the communication by milk is well established: Typhoid fever, cholera infantum, and tuberculosis, or tubercular consumption—three of the most deadly diseases known. It is very probable, also, that diphtheria, scarlet fever, and several other maladies are communicated through the medium of milk.

But if no other maladies than the first three named are liable to be disseminated by the use of milk, there is ample reason for regarding this article of food with grave suspicion until its purity and innocuousness has been established.

An important reason for the consideration of this matter at the present time is the fact that within the last few years the developments of the science of bacteriology have rendered it necessary for us to carefully review and remodel many of the practices of modern life, and to attach great importance to matters which were formerly very lightly regarded.

The customs and environments into which we were born are those which were modeled upon a state of knowledge which did not include more than the smallest degree of enlightenment in relation to the germ causes of disease. The present knowledge concerning this subject is almost wholly the product of the scientific labors of the last quarter of a century, and a much shorter time has elapsed since the intensely practical value of a great number of long-known facts has been fully appreciated, even by students of science, and it now becomes the duty of sanitarians to bring these truths of practical importance, which have a most momentous bearing upon the conditions and customs of every-day life, home to the people in such a

manner as to command their attention and secure for the scientific facts presented a practical recognition.

Some twenty years ago the writer was exhibiting, through a microscope, to a lady of more than ordinary intelligence, some of the forms of microscopic life which occasionally infect food substances. When she learned that notwithstanding their formidable appearance through the microscope, their actual size was measured only in thousandths of an inch, she exclaimed with great emphasis, "I am not afraid of such little fellows as those are!" Unfortunately, size is not a measure of capacity for mischief. The farmer dreads much more the minute weevil or the microscopic smut which attacks the grain in his wheat fields than the mole which burrows about its roots.

The eminent French scientist, Pasteur, has shown the very great power for mischief which resides in the infinitely small. Microscopic forms of life, animal and vegetable, are vastly more potent for mischief in this world, more destructive to human life, than any of the more obvious and better known causes of death and disease.

The accompanying illustrations show some of the more common and interesting forms of microbes, representing, however, only a very few out of the many thousands of forms which have been studied.

Numerous observations during the last twenty-five years have shown that milk is a frequent means of communicating typhoid fever infection. Infection of milk has sometimes been traced to the adulteration of the milk with water which had been contaminated by excreta from typhoid fever patients. In other cases the infection has occurred through the washing or rinsing of the milk cans or pails with infected water. There is, however, another source of infection which has been generally overlooked.

Several years ago, when I was a member of the State Board of Health, at one of the quarterly meetings of the Board, I called attention to the possibility of the infection of milk with typhoid fever germs through the excreta of cows; and in a paper read in 1888, before the Calhoun County Medical Society, upon the "Propagation of Typhoid Fever," I also called attention to this means of infection, which I believe to be one of the most common, although as yet rarely recognized. It is very well known that in a great number of cases of typhoid fever it is impossible to trace a direct relation to a preceding case. I believe that in a large proportion of these cases a thorough bacteriological study of the milk-supply would show this to be the source of infection.

It is generally held that cows are not subject to typhoid fever; nevertheless it is entirely probable that the capacious colon of the cow may serve as an excellent field for the development of typhoid fever germs. While the digestive fluids of the stomach of a cow, as well as the gastric juice of the human stomach, are capable of destroying typhoid fever germs under certain conditions, it is doubtless true in the case of a cow, as with human beings, that derangement of the digestive organs may so alter the character of the digestive fluids as to deprive them of their power to protect the body from the invasion of germs by digesting these destructive organisms. In other words, a cow which might not be able to transmit typhoid fever germs while in a state of health, might while suffering from indigestion as the result of excessive feeding or the use of improper food, if infected, transmit through her alimentary canal the germs or their spores without destruction. thus infecting the milk.

The importance of this subject is at once recognized when we consider the facility with which the fecal matters of the cow become mixed with milk, especially when cows are kept confined in a stable or small enclosure.

A few years ago, I attempted to settle this question by actual experiment. A calf was regularly fed, first with sterilized milk inoculated with a pure culture of Eberth's typhoid bacillus and later with sterilized milk inoculated with fecal matters from a typhoid fever patient. The fecal matters of the calf were regularly collected and sent to Prof. Novy, of the University of Michigan, for bacteriological examination. The conclusions reached were not as definite as could be desired, but among the various bacteria isolated, Prof. Novy found a number which resembled very closely the typhoid bacillus, and some which were apparently identical with the bacteria which Prof. Vaughan has associated with typhoid fever. The experiment, while it did not actually prove that Eberth's bacillus may pass unchanged through the alimentary canal of the cow, did show that the fecal matters of a calf fed upon milk infected by the excreta of a typhoid fever patient, contain fever-producing germs.

Recent bacteriological studies of the cause of typhoid fever have developed another fact which is of great practical interest in this connection.

Rodet and Roux, two eminent French investigators, as the result of extended investigations, have arrived at the conclusion that the so-called bacillus of Eberth is at least not the only cause of typhoid fever, but that in many cases the disease is due to another germ, the bacillus coli, a microbe which is constantly present in the colon of all mammals.

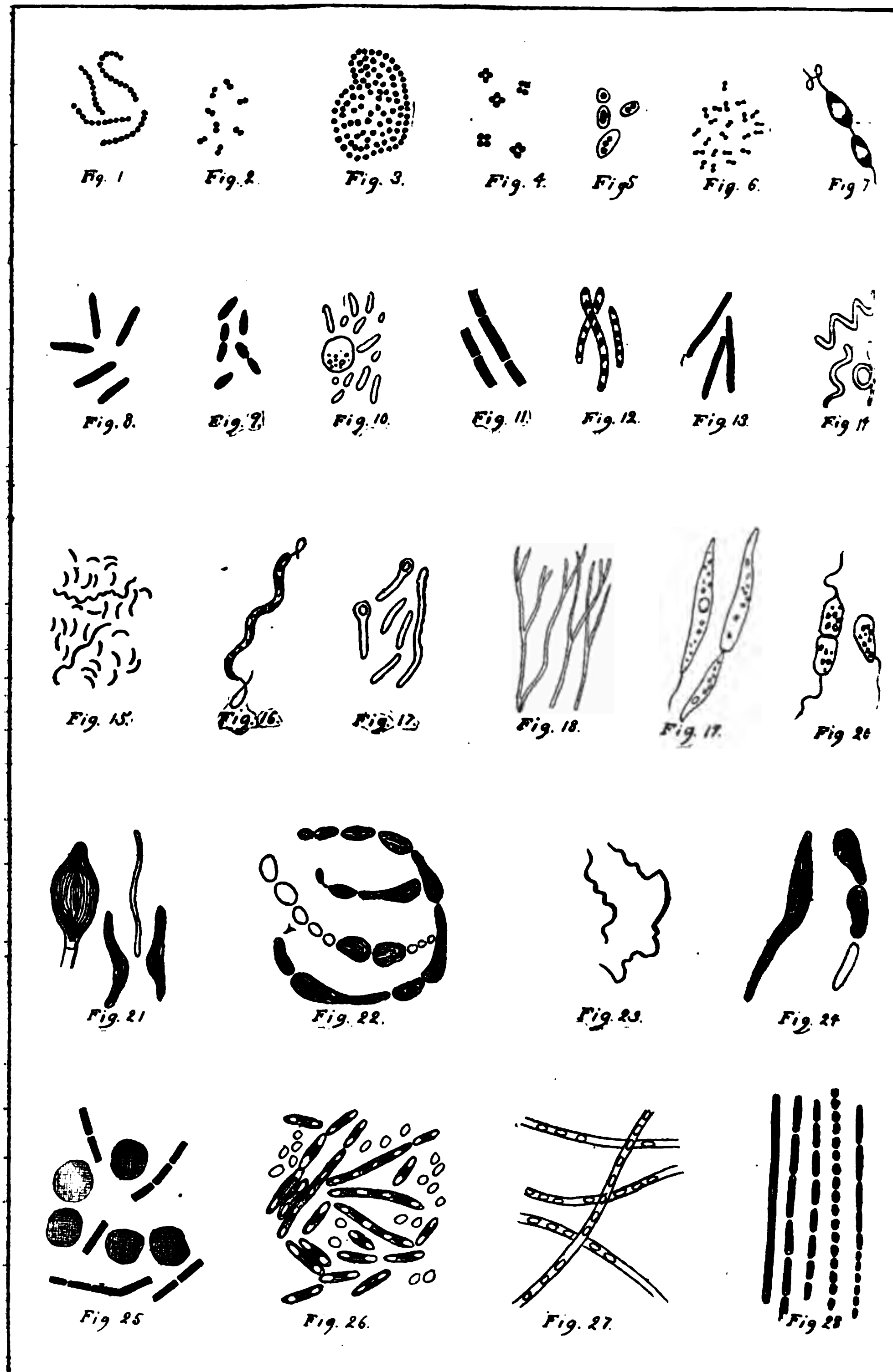
The author contributed a paper upon this subject to the proceedings of the American Public Health Association, at its annual meeting held at Mexico City, 1892, in which the facts bearing upon the question were presented at length. Among these facts may be mentioned the following:

1. The bacillus coli, found in the excreta of man and of all domestic animals, is capable of producing disease apparently identical with typhoid fever, and various forms of intestinal disease, as cholera morbus and cholerine.

2. The colon bacillus develops virulent properties outside the body when deposited in vaults, in which it may live a long time; while Eberth's bacillus, the so-called bacillus of typhoid fever, quickly dies when exposed to the ordinary conditions found in vaults.

3. The colon bacillus obtained from excreta which has been deposited in vaults, produces toxines of much more deadly character than those of the bacillus obtained directly from the colon and those produced by Eberth's bacillus.

The immense importance of these facts will be recognized only when we take into consideration the facility with which cows may become infected with the excreta of human beings. Although no small care is taken to secure pure water supply for human beings, very little attention, indeed, is given to the water supply of animals, probably because no serious ill effects can often be traced directly to the use of impure water by animals, at least so far as the animals themselves are concerned, the fact being overlooked that while domestic animals may have acquired a certain immunity from the effects of impure water by constant exposure, they may be the vehicle for transmitting these impurities to human beings. But in the light of the facts presented, is it not clear that the same pains should be taken to provide a milch cow with pure water as is taken to secure a pure water supply for direct consumption by human beings?



GERMS OR MICROBES.

EXPLANATION OF PLATE.

Fig. 1. Micrococci arranged in chains (*streptococcus*).
Fig. 2. Micrococci in pairs (*diplococci*).
Fig. 3. Micrococci in a mass or swarm (*zoogloea*).
Fig. 4. Micrococci arranged in groups of four, found in the sputa of consumptive patients.
Fig. 5. Micrococcus of pneumonia.
Fig. 6. *Bacterium termo*, found in decomposing matter.
Fig. 7. *Bacterium termo* magnified 4,000 diameters.
Fig. 8. *Bacillus subtilis* (the hay bacillus found on manure, or in a decoction of hay).
Fig. 9. *Bacterium lineola*, germs from stagnant water; sometimes seen in slimy masses on rotten potatoes; also found in well water.
Fig. 10. Bacillus of typhoid fever.
Fig. 11. Malaria bacillus, found in the blood in cases of malarial fever.
Fig. 12. Bacillus of tuberculosis.
Fig. 13. Bacillus of leprosy.
Fig. 14. *Spirillum undula*, found actively moving in decomposing infusions.
Fig. 15. Cholera germs.
Fig. 16. *Spirillum volutans*, a germ with flagella, found in marsh water.
Fig. 17. *Vibrio regula*, germs found in decomposing vegetable matter.
Fig. 18. *Cladothrix dichotoma*, the most common germ found in water containing decomposing animal or vegetable matter.
Fig. 19. *Rhabdomonas rosea*, germs which form the red-colored scum on ponds.
Fig. 20. A germ similar to the preceding, of a pale red color, found in stagnant water.
Fig. 21. Forms of germs found in stagnant water and in drain pipes. The latter are sometimes obstructed by the white masses formed by them.
Fig. 22. *Bacterium aceti*, the germ which produces vinegar.
Fig. 23. Cholera germs.
Fig. 24. A germ which causes fermentation.
Fig. 25. Germs of *anthrax* in blood from spleen of a mouse.
Fig. 26. Germs of *anthrax* grown on a potato.
Fig. 27. *Anthrax* germs at a different stage of growth.
Fig. 28. Different stages of growth of a germ discovered in foul water.

It is safe to say that very few people, indeed, are fully acquainted with the dangers to life and health which lurk in the milk supply. Strange as this may appear, a still stranger observation is the fact that almost every savage nation on the face of the globe that makes use of milk in any form, has learned by experience to adopt measures of protection of a more or less effective character, while the English and Americans are about the only peoples who seem to have profited nothing by sad experience in this particular.

Among most savage tribes milk is seldom or never used. The teeming millions of China—a country which contains nearly one-third of the entire population of the globe, are practically ignorant of this article of food. The high-caste Hindoo regards milk as a loathsome and impure article of food, speaking of it with the greatest contempt as "cow juice," doubtless because of his observations of the deleterious effects of the use of milk in its raw state.

The savages of Central Africa make use of milk only after converting it into a sort of kumyss by leaving it for some hours in a gourd specially prepared for the purpose. A portion of the ferment is always left behind in the gourd, so that a strong degree of acidity is developed in a few hours.

The half-civilized Tartars of Western Asia prepare milk in the same manner, as do also the Turks and the Armenians. The natives of Italy use milk from goats instead of that from cows, a custom which will be better appreciated when the fact is known that goats are not subject to that dread disease, tuberculosis, so common among cows. Even the German peasant scalds the milk as soon as it comes from the cow, and makes little use of the article except in the sour state, in which it is comparatively safe. The Irish peasant is equally fond of sour milk, and the same is true of the natives of Scandinavian countries.

The French dairywoman scalds the cream before she churns it, experience having shown her that by this method a superior quality of butter may be made, although the philosophy of sterilization is probably unknown to her.

American and English people, as before stated, stand almost alone in the recklessness with which they make use of raw milk as a food and as a beverage, and in the fact that they seem to have learned nothing by the experience of centuries in the use of an article which is certainly responsible for a prodigious annual addition to the mortality list.

Let us glance into the conditions which give origin to the microscopic dangers to life and health which lurk in milk.

There are various germs which change the color of milk, each producing a characteristic color. Other germs produce a peculiar flavor, as acid or bitter, still others change the consistency of the milk, producing either a thickened or coagulated condition, or rendering the milk thready or viscid in character. The following are a few of the more important examples of this sort:

Blue Milk—The peculiar color of blue milk, not referring, of course, to milk which has been made blue by skimming, is due to the development of a peculiar coloring matter by the bacillus cyanogenus. The blue color does not appear, however, when the germ is planted in sterilized milk, but only by its growth in raw milk, as the development of the blue color requires the presence of lactic acid. A gray color is produced in sterilized milk.

Red Milk—The bacillus prodigiosus gives rise to a red color, which appears in patches upon the surface of the milk. Two species of red yeast produce a red or brownish color, which first appears at the surface of the milk, then gradually extends until the whole is colored.

The bacterium lactis erythrogenes colors the whey only.

A dozen different lactic-acid-producing germs are ordinarily found in milk, and there are a great number of other germs which produce sour milk.

Freudenreich has shown that the unusually spongy condition often found in cheese, giving the cheese a swollen or puffy appearance, is frequently due to germs furnished by the intestines of the cow. Some germs ferment casein but do not produce lactic acid, but a sort of rennet. The germs which produce lactic acid are killed at a temperature of 158 degrees F. The spores of some germs which ferment casein resist a temperature above the boiling point of water, sometimes even 248 degrees F.

There are many of these germs, ten or more species of which are well known, besides a large number included under the general term, "potato bacilli," which comprise a great variety of germs that grow upon the surface of the earth, and also a large number of bacilli which cause butyric acid fermentation.

Cheese owes its properties to the development of these various germs at the expense of the sugar of milk, the casein, and the fat which it contains.

Drs. Schaffer and Bondzynski showed many years ago that cheese made from cooked milk does not mature.

Adametz has shown that the addition of thymol and other germicides to milk in making cheese prevents the maturing of the cheese.

Yeasts and Molds—A variety of yeasts grow in milk. The characteristic action of yeast in milk is the production of lactic acid and alcohol. Some of these yeasts coagulate milk, others do not. Kumyss is one of the familiar products of the action of yeast upon milk. Kephir is a variety of kumyss produced by a peculiar yeast found in the so-called Kephir grain.

The red yeast already referred to, sometimes develops in cheese.

A white mold, *oidium lactis*, sometimes forms upon the surface of milk as well as upon other substances.

Green mold also sometimes attacks milk. It is, in fact, the principal agent in the production of the famous Roquefort cheese. Brie cheese owes its peculiar properties to mold. In the manufacture of these varieties of cheese, the development of mold is promoted for the purpose of securing the peculiar flavors characteristic of these molds when grown in milk.

Yellow Milk—Bacillus synxanthus produces a disease which coagulates the milk, then a rennet which dissolves the casein and colors it yellow.

Bitter Milk—There are many different germs which produce bitterness in milk. They are most likely to occur in milk which has been boiled and then allowed to stand for a long time. In raw milk they are overwhelmed by other germs, and do not develop; but the spores survive cooking and develop later. There are a few germs capable of causing bitter milk which resist the action of other germs and grow in raw milk.

Thready or Viscid Milk—More than a dozen different germs have been described which produce a thready or viscid condition of the milk. It is a sinuglar fact that this condition of the milk is promoted as the basis of the manufacture of Edam cheese. Conserves of thready milk are also made in Norway, where pains are taken to produce a viscid condition of

the milk in the manufacture of a peculiar kind of preserved milk known as Tättemyelk. The condition is produced by adding small leaves of a species of grass, the *pinguicula vulgaris*; sometimes instead, the same grass is fed to the cows, which suggests at once the manner in which the milk may become infected. The cows eat the grass, the mouth and nose of the cow becomes infected, they transfer the germs to the udder, and from the udder they readily find their way to the milk pail.

Disease-Producing Germs—Much more important from a sanitary point of view than the various yeasts, molds, and color-producing germs which have just been mentioned, are the pathological microbes, or disease-producing germs, many of which grow with great facility in milk. Some of the diseases arising from these germs, as cholera and typhoid fever, have already been referred to.

It has been shown that cholera germs grow with less facility in raw milk than in cooked milk, lactic acid interfering with the development of the cholera germ, so that sour milk may be, under certain conditions, safer as an article of diet than sweet milk, if the latter is uncooked.

Certain forms of influenza have been proven by Freudenreich, the director of the Bacteriological Laboratory of Berne, Switzerland, to be transmitted by means of milk. This was found to be especially true of the peripneumonia of hogs.

Dr. Hart, an eminent English sanitarian, records fourteen epidemics of scarlet fever and seven of diphtheria, originating in England, in which the contagion was disseminated through the medium of milk.

Typhoid fever has been found to originate in the use of infected milk in a great number of cases, as has already been shown. The typhoid fever germs grow with great facility in milk.

One of the greatest of all the dangers connected with the transmission of germs by means of milk, is encountered in the fact that the germs of tuberculosis thrive in milk, and retain their vitality for many weeks even, in butter and cheese. The bacillus tuberculosis, the contagious element of the disease commonly known as consumption, is probably more frequently to be found in milk than any other dangerous germ.

Hirschberger, an eminent German authority, found ten per cent of the cows in the vicinity of large cities affected by tuberculosis. Cows kept for dairy purposes in the immediate vicinity of cities are generally subjected to much more unhealthful conditions than those in the country. The milk of half the cows examined, or five per cent of the entire number, was found to contain the tubercle bacillus. As the milk from the different cows was mixed together, it is probable that nearly the entire milk supply of the cities supplied by the cows examined, was infected with consumption germs.

An investigation of this subject made in Copenhagen a few years ago, showed tubercle bacilli in one-seventh of all the specimens of milk examined.

Brouardel, an eminent French authority, found five cases of tuberculosis in a small boarding school of fourteen girls. The disease was traced to the use of the milk of a tuberculous cow.

Gasperini found tubercular germs alive in butter at the end of 120 days.

Gautier found them alive in cheese at the end of thirty-five days.

The importance of this subject can only be appreciated when bearing in mind the extent and increasing prevalence of tuberculosis in human beings.

The fact that in older populations, like those of England and New England, the proportion of deaths from consumption to deaths from all other causes rises as high as twenty or thirty per cent, whlile in the newer communities of the west the proportion falls to eight or ten per cent, is an evidence that conditions exist in intimate connection with life in a civilized community which favor the development of this dread disease. The revelations of the postmortem rooms connected with the metropolitan hospitals of this and other countries, have shown that sixty per cent of hospital patients who die have suffered at some time in their lives from infection by the bacillus tuberculosis, as evidenced by the characteristic lesions which have been left behind. The great majority have, of course, recovered from the disease—thanks to favorable conditions and the natural recuperative powers of the body—but this fact is, nevertheless, evidence that infection of the human race in civilized communities with the bacillus tuberculosis, has come to be, at the present time, exceedingly common. Indeed, it may be said that such infection threatens to become universal.

It is an inevitable conclusion, from these facts, that the causes of tubercular infection, whatever they may be, must be widespread and intimately connected with the conditions of civilized life. That tuberculosis is an infectious malady is a question which we shall not undertake to discuss, as the purpose of this paper is only to bring before this convention this highly important question for the purpose of inviting a discussion of the possible relations which exist between this malady and the use of cow's milk.

That consumption is in some way connected with the cow is thus very ably argued by Dr. F. R. Brush, who calls the cow "the wet nurse of consumption:"

"Scrofulous females in the human race usually secrete an abundance of milk, because in scrofula there is an unusual tendency to glandular enlargement and activity. As the mammary is the highest type of glandular structure, it is stimulated to increased action. A scrofulous cow is usually the largest milker, and the closest kind of consanguinity has been practiced by cattle breeders, with the object of producing a scrofulous animal, not because she is scrofulous, but because the particular form she represents are the largest yielders of milk. We find, too, that consanguinous breeding has been alleged as one of the causes of tuberculosis in the human race, where it can never be conducted with so close and intimate blood relations as in the dairy animals.

"The absence of phthisis in high, dry, mountainous regions has been accounted for by reason of the altitude and absence of moisture in the atmosphere, but here occurs a somewhat curious fact; namely, that the cow does not thrive in the high, dry, mountainous districts, but on the low, swampy, moist region where the succulent and moist grasses grow, is the place where the cow flourishes, and it is in these regions also that tuberculosis abounds in both bovine and human subjects."

That tuberculosis may be communicated through the milk of tuberculous animals, at least under certain circumstances, is strongly suggested, if not absolutely proven, by the disproportionate frequency with which enteric consumption occurs in young children. A case recently reported in medical journals illustrates very clearly the possibility of infection by tuberculosis through the alimentary canal. Four infants were cared for by a tuberculous nurse who fed the little ones with a spoon, and was in the

habit of tasting the milk herself to test its temperature before each feeding. All four of these children suffered and died from enteric consumption—a very clear case of infection.

In a recent paper read before the New York Veterinarian Medical Society, January 9, 1894, published in the *Journal of Comparative Medicine*, Dr. James Law, of Cornell University, states as follows: "In the case of calves sucking phthisical cows, they have done badly and proved unthrifty, though they took the whole of the milk furnished by their respective nurses, and they have thriven better when weaned and put upon solid food alone. I have followed some such calves until they grew up and were slaughtered, and have made post mortem examinations and found them bearing old calcified tubercles, pointing back to the time when they sucked the infected and poisonous milk."

Bollinger showed that a pure culture of tubercle bacilli gives positive results in inoculation experiments in a dilution of one to four million parts, thus showing that milk may be infectious when the bacilli are so scanty as to be undiscoverable with the microscope without an extremely exhaustive examination. This shows that inoculation is really the only method of determining the infectious or non-infectious character of the milk.

Hirschberger made inoculation experiments on guinea-pigs with samples of milk obtained from twenty tuberculous cows. He obtained positive results in 80 per cent of his experiments, in cases in which the disease was far advanced, and in 35 per cent in cases in which the tuberculous process was confined to the lungs. The milk was found to be more infectious at certain times than at other times, the increased infectiousness being due to the presence in the milk of spores which had been set free from some focus of the tuberculous disease and absorbed into the lymph channels, and thus carried to the mammary gland and secreted with the milk. A most painstaking microscopical examination made of the milk, even in the successful cases, failed to reveal the presence of the tubercle bacilli except in a single case, showing the unreliability of this mode of examination.

The following case is cited by Hirschberger as a very convincing illustration of the infectious character of milk from tuberculous animals: "The owner of a very valuable herd of cattle," says the author, "finding that a very large porportion of them were tuberculous,—so large a proportion, indeed, as strongly to suggest infection by association in the sheds—withdrew his milk from the market, and used it, unfortunately without boiling it, for fattening his pigs, of which he has a large number, and on which he prides himself not less than on his cows. The result has been that the pigs have, almost without exception, been affected with the disease to an extent that has necessitated the slaughter of the whole stock."

An important fact which seems to have been overlooked until recently, is that to which Prof. Law has called attention in the paper above referred to. Since Prof. Koch's famous experiments with tuberculin, which created so profound a sensation in the medical world a few years ago, it has been well known to physicians that the substance known as tuberculin—the toxic product of the tubercle bacilli—is capable of producing most profound effects when introduced into the system of a human being or an animal in the slightest degree affected by tuberculosis. It is the paralyzing influence of this poison upon the tissue elements which gives rise to the necrosis of tissue and the formation of cavities in the lungs and other organs which are the seat of tubercular deposits.

Having been one of the first in this country to obtain a supply of tuberculin, which I did through the kindness of the American Minister at Berlin, I have had an opportunity to study its effects upon human beings, and, with others, have been greatly astonished to see the profound effects produced by the most minute doses, so small a dose as even the fraction of a milligram—perhaps one five hundredth of a grain—being capable of producing positive systemic effects. I have known of the injection of two or three minims of tuberculin to give rise to an elevation of two degrees of temperature in a perfectly healthy cow, and have seen a temperature of 105 degrees in a human being—an elevation of six and one-half degrees above the normal—result from the use of one or two milligrams of tuberculin. A poison which is thus active in such minute doses must be very potent indeed.

In a tuberculous animal, tuberculin is being constantly produced in quantities exactly proportionate to the number of bacilli actively present. The rapid elimination of the poison through the kidneys and other excretory organs saves the patient from profound toxic effects, although the steady wasting of the tissues which has given rise to the significant name of "consumption," the rise of temperature, the night sweats and the diarrhœa are all evidences of continued toxæmia. When, however, the amount of this extremely powerful poison, which is constantly present in the system and to which the body accommodates itself to a certain extent, is increased by the hypodermic injection of even a small quantity, the tolerance of the system which had been gradually acquired is overborne, and the toxic effect is manifested in what is termed a reaction. These effects can be easily watched, if the tubercular lesion is superficial, as in lupus, and are manifested in a marked change in color and a swelling up, and finally in death and sloughing of the affected parts. If the affected tissues happen to be upon the surface of the body, or, if in the lung, located close to a large air tube, suppuration of the diseased tissues and a complete clearing away by the sloughing may occur, and all of the affecting microbes may be carried away with the sloughing mass. Thus recovery may result. But if the tubercular foci are not thus favorably situated, but instead are located in the depths of the tissues, as in the center of some dense organ, then the effect of the tuberculin may be to break down the wall of resistance which nature has thrown up around the tubercular mass, and thus set free the myriads of active microbes which had previously been restricted to a small area, and so set up a general infection of the whole body, converting a local and comparatively harmless lesion into a general infection and hopeless disease. It was the possibility of such results as these which led to the abandonment of the use of tuberculin in the treatment of consumption by the great number of enthusiastic physicians, who, like myself, seized eagerly upon the much-praised panacea for the most destructive of all human maladies.

From the above briefly stated facts, it is apparent that the evil results which follow tuberculous infection are not wholly due to the bacillus itself, but are also attributable to the toxines produced by it.

Now, the important fact to which Law has called attention is this: namely, that even though the milk of a tuberculous animal may be proved to be free from tubercle bacilli, and hence not capable of giving rise to tubercular infection, or if the infected milk shall have been sterilized so that it no longer contains living bacilli, still these

animal products are, nevertheless, capable of producing most potent mischief through the toxic products of the bacilli which they contain.

In the blood and lymph of every animal suffering from tuberculosis there must be circulating a variable amount of the extremely toxic substance called tuberculin. The milk, as well as the juices of the flesh of such animals must always contain a certain proportion of this poison. It is thus apparent that whoever makes use of the flesh or milk of such an animal is thereby introducing into his system more or less of this extremely active and dangerous poison. That the effects of poisoning through this source are not everywhere recognized, is no evidence that such effects are not produced, as Prof. Law very well says, "It is the scrutiny, and not the facts, that is wanting." We have not been looking for facts from this source, and so have not seen them. But that effects must be produced, there seems to be little, if any, room to doubt. Prof. Law says: "In my experience with tuberculous cows, cases have come to my knowledge in which invalids drinking the milk of such animals have suffered very obviously, and have improved after such milk has been withheld." The same fact has been noted by Prof. Law in relation to calves, as stated in the quotation previously made.

Dr. A. N. Bell, editor of the *Sanitarian*, a number of years ago undertook a research in relation to the influence of the milk of tuberculous cows upon infants. He found that a great number of infants supplied with milk from a certain dairy were sickly, puny, and in every way unthrifty. Investigation showed that a large number of the cows in this dairy were tuberculous. This observation agrees entirely with that made by Prof. Law. I have made no personal observation of this sort, but a laboratory observation which I made a year ago, seems to have sufficient bearing upon this question to be worth relating. In the course of a series of experiments for the purpose of studying, by the method of Bouchard, the relation of the toxicity of urine to various maladies, I made use of the urine furnished by a consumptive patient. The experiment consisted in the injection of carefully filtered and neutralized urine into one of the veins of the ear of a rabbit which had previously been carefully weighed, its temperature taken, etc. A careful note was taken of the amount of urine required to produce death, and of all the symptoms. One of the most marked symptoms was found to be a rise of temperature—the temperature of the rabbit increased from three degrees to five degrees F. within five minutes from the time the injection was begun. The temperature was taken per rectum both before and after the intravenous injection, and the greatest care was taken to secure the highest degree of accuracy possible.

This observation is not anomalous, as similar facts have been observed in the injection of the urine of patients suffering from typhoid fever and other febrile maladies.

The fever of a consumptive is due to the presence of tuberculin in the circulation. The fever in the rabbit was due to the presence of tuberculin in the circulation which had been excreted by the consumptive through his kidneys. It will be admitted that the milk of a tuberculous cow must contain a much smaller proportion of tuberculin than does the urine of the same animal, nevertheless, since the fluid portion of the milk is made up from the plasma of the animal's blood, it is evident that it must contain at least as large a proportion of this extremely soluble and poisonous product as is found in the animal's blood—perhaps even a larger quantity,—the readi-

ness with which toxic subtances of various sorts are excreted by the mammary gland being too common an observation to require more than mention.

This matter is certainly one of most profound importance. Tuberculin is not destroyed by sterilization nor by any culinary process. If present in the animal when alive, it will certainly be present in its flesh and milk, and those who make use of these infected substances as food, must run an enormous risk of injury. From the results of the postmortem study to which I have already referred, and by which we have learned that in large cities, at least, about one-half of the poor population are more or less affected by tuberculosis at some time in their lives, it is evident that an equal number of those who make use of the flesh or milk of tuberculous animals are likely to suffer the greatest injury thereby, through the intensification of the tubercular process or the diffusion of the circumscribed disease.

Since sterilization affords no certain protection from this danger, it is evident that inspection is the only precaution to which positive value can be attached, and this inspection must be thoroughgoing; it must include not only an ocular inspection of animals, but the injection of tuberculin.

So thoroughly impressed was I with the importance of this method that, after reading Prof. Law's paper, I immediately proceeded to secure a careful investigation of each one of the 112 animals which furnish milk for the hospital and sanitarium of which I have charge. The astonishing thing to me is that I should so long have remained apathetic to a question of so great importance. It has, indeed, many times occurred to me that the milk of tuberculous animals must contain more or less tuberculin, but I had never given the matter sufficient thought to become impressed with its importance. Prof. Law has certainly become a public benefactor in presenting this subject so forcibly and lucidly, and it is to be hoped that live stock commissioners and veterinarians everywhere will recognize the importance of this phase of the question, which has heretofore been utterly neglected.

There is still another feature of this question to which, it seems to me, sufficient importance has not been attached, namely, the infection of human beings with tuberculosis by contact with tubercular animals, aside from the use of their flesh or milk as food. That tuberculosis is usually contracted by the reception of germs into the air passages is a point upon which there will probably be no controversy. The reception of the microbes in the form of dust, by respiration, is unquestionably the most frequent form of contagion. A case which once came under my observation may be worthy of mention, although it seems hardly necessary to add to the vast amount of positive evidence which has accumulated within the last ten years. On inquiring the history of the case of a lady suffering from tuberculosis, who came under my care some five years ago, I was informed that her husband had died of the disease some two years previous. During the last two months of his life he was confined to his bed and expectorated enormous quantities. The family resided upon a Nebraska farm, and were entirely ignorant of the nature of the disease, not being instructed by their physician. The housewife, being busy with her household duties, and burdened with the care of several small children in addition to that of her invalid husband, often neglected to wash the cloths upon which he expectorated. She simply dried them and rubbed

them up in her hands to restore pliability thus reducing the infectious matter to powdered form and diffusing it through the atmosphere of the room in the most effective manner possible. She naturally contracted the disease herself, and when seen by me was in the very last stages, and died a few weeks later.

The *British Medical Journal* recently reported the following case, which indicates the tenacity of life in the bacillus of tuberculosis under ordinary conditions:

"A family of nine moved into a house occupied ten years previously by two tuberculous patients. A short time after, although the whole family had been in splendid health, three among them showed symptoms of tuberculosis. They used the same bedroom as the former tenants. Dr. Ducor had pieces of wall paper examined and dust from the ceiling and walls was also examined. In both cases the tubercle bacillus was found. The former occupants had been uncleanly in their habits; the sputa had dried on the walls, and the bacillus, as M. Vignal has shown, retained its vitality, and was not destroyed by attempted disinfection."

A recent number of the *Journal des Connaissances Medicales* reports some cases of tuberculosis which were contracted by the new occupants of an apartment contaminated by the expectorated matters of a tuberculous patient who had died there two years before.

Sawisky, who has investigated the length of time that dried sputum retains these infectious properties, reports that virulence was retained for two and one-half months. He found this to be true even when the sputum was exposed to the sunlight, the destructive effect of sunlight upon microbes, which is well known, being only observed in the bacillus tuberculosis when the sputum was spread out in very thin layers.

Flick has prepared a map of the fifth ward in the city of Philadelphia which locates everyhouse in which tuberculosis has occurred within the last twenty-five years, and shows that the disease has chiefly prevailed in a series of infected houses which constitute less than one-third of all the houses in the ward, but have furnished more than half the deaths. It was also observed that a large percentage of all the cases of mesenteric tuberculosis in children occurred in these houses.

Another fact in addition to those which have been cited, showing the danger connected with infected apartments, is the extreme liability to disease of nurses who care for consumptive patients. Cornet showed from statistics of 87,000 nurses, that 63 out of every 100 of them died of tuberculosis, the proportion of deaths from tuberculosis up to fifty years being 75 per cent. Is it not reasonable to suppose that the dairyman who cares for a cow suffering from tuberculosis is at least equally as liable to contract the disease from the cow?

A point of importance to which we wish to call special attention is the fact that the sputum of tuberculous cattle and the apartments occupied by such cattle are as dangerous a source of infection, and more so, than the sputum of human beings, or the apartments occupied by them.

Dr. Bell noted, in his observations previously referred to, that healthy cattle placed in stalls which had previously been occupied by tuberculous animals, soon become infected with the same disease. Doubtless the source of infection among animals is the same as that which prevails most frequently among human beings, namely, the inhalation of the infected matters reduced to powder and floating in the air as dust.

It is doubtless true that contagion from animal to man is much more common than from man to animal, and yet that contagion may occur from animal to man cannot be doubted. A case is reported in which a flock of chickens became almost wholly tuberculous through eating the expectorated matters of a consumptive young man who had charge of them and fed them, spending considerable time with them in the yard.

Hoffman has shown that flies may take up the tubercle bacilli from infected sputum, and discharge them alive and active with their excreta. A number of flies fed upon infected sputum died after a few days. Whether death was due to the growth of the microbe or to the toxic effect of the tuberculin absorbed was not shown by the experiment. It is known that the bacilli of leprosy are communicated by flies alighting upon a raw surface, and I deem it quite possible that infection of the skin, resulting in lupus, or of the lymphatic glands, producing scrofulous enlargement, may occur in this way.

A curious fact to which attention has been called, is that earthworms may receive into their bodies and retain there in a virulent condition the tubercle bacilli for many months. These bacilli may be deposited upon the surface of the earth with the excreta of the worm, become reduced to powder, raised in the air by some passing breeze, and thus find their way to human lungs. In this way the expectorated matter of cattle in pastures may find access to human beings.

In licking herself a cow suffering from tuberculosis may soil the hair about the udder or flanks with infected saliva, which, after drying, may be rubbed off during the act of milking and find its way into the milk. This may be a source of infection of milk, in cases in which, when taken with special precautions directly from the udder, the milk gives no evidence of infection.

Numerous other ways in which tubercle bacilli may be communicated to human beings from an infected animal may be easily conceived.

The extent to which tuberculosis prevails among cows and other domestic animals is a subject concerning which we are at present considerably in the dark, since no sufficient, thoroughgoing investigation has been made to give us definite and accurate information. The superficial examinations which are made in connection with slaughter houses and packing establishments have shown a percentage of infected animals as high as 2 or 3 per cent.

Jorissenne, who claims for the veterinary surgeons of Belgium the honor of first calling attention to the danger in the use of the milk of tuberculous cows, states that out of every hundred cows four are tuberculous.

It is evident that safety from this source of danger to human life can be found only in a thorough inspection, not only of all cows and cattle furnishing food for human consumption, but of all domestic animals which are subject to this disease. The astonishing thing is that there should be so little interest in relation to this question. Tuberculosis is a disease which is much more rapidly fatal in its effects, much more actively contagious, than the much dreaded leprosy of India and the South Sea Islands, and is almost equally fatal when it has obtained a foothold in the human system.

The results of the inquiry made in India by the leprosy commission recently appointed by the British government, show that leprosy is not propagated by direct contagion from one human being to another, but through the air, doubtless by means of fine particles of dust carrying the

germs of the disease. Leprosy germs were found in the dust gathered from a ground surface over which a leper had walked. Consumption also is doubtless most frequently communicated through the medium of dust.

Another interesting fact is found in the pathological resemblance of the two specific microbes characteristic of these diseases. The appearance of the two germs is almost identical. Indeed, their resemblance is so close that a bacteriologist of some note has recently come forward with the assertion that they are absolutely identical; in other words, that the disease commonly known as consumption, or tuberculosis, is only another form of the disease commonly known as leprosy. Certain it is, that consumption is a disease much more to be dreaded than leprosy. A malady which destroys more than one-sixth of all who die in this country must have some cause which is very general, very potent, and withal very subtle. It is not to be wondered at that there has been much discussion with reference to the nature of this cause. If it had been very easily discernible, it would long ago have been fully recognized and would have been suppressed.

It is the firm belief of the writer, however, that the wonderful development in bacteriology and physiological chemistry which the last decade has witnessed, has brought to us a solution of this question, and that it only remains for sanitarians to grapple with it resolutely and to urge upon national, state, and municipal authorities everywhere the duty of undertaking a thoroughgoing and unrelenting crusade against a disease which is annually responsible for more deaths than war, pestilence, and famine, combined; a disease which has been very aptly demonstrated "The Great White Plague," and which is, in the light of modern researches, as proper a subject for public health measures, restriction, quarantine, and isolation, as small-pox, yellow fever, or cholera.

The boards of health of several States have considered the matter of sufficient importance to send out in great numbers, pamphlets warning the public with reference to the necessity of destroying the sputum of consumptives and carefully disinfecting the premises which have been occupied by them. Similar steps have been taken in England. The health officer of the city of Manchester, England, advertises himself as ready to disinfect, free of expense to the owner, apartments which have been occupied by consumptives.

More than two years ago the government of Prussia took cognizance of the importance of this question, and issued an admirable publication including a series of rules relating to the prevention of this disease. Tubercular midwives were forbidden to practice their profession. Town corporations were recommended to provide disinfecting apparatus for the disinfection of infected houses and clothing. It is certainly high time that attention should be given to two of the most important causes of this disease—the use of infected flesh and milk and the contact of human beings with infected animals. Consumption should be classed with other contagious diseases, and treated in a manner consistent with known facts relating to its contagiousness. State and municipal authorities should require a careful inspection of the meat and milk supplies of all public institutions.

I considered it my duty to make an investigation of this sort in relation to the milk supply of the institution of which I have charge. The investigation was made under the supervision of the State Veterinarian of Michigan, who employed tuberculin furnished by the department of agri-

culture in Washington, in accordance with the rules laid down by the department for such investigations. Although not a single case of tuberculosis was found among the 112 cows examined, I shall continue the application of the test, and hereafter will admit to the establishment no milk which is not furnished by animals which have been subjected to the tuberculin test. The fact that occasionally instances are found in which large herds of cattle are entirely free from tuberculosis, renders all the more important a thorough investigation of this matter, as it emphasizes the contagious character of the malady and the possibility of the complete eradication of the disease.

In the discussion of a paper which I presented at the National Live Stock Sanitary Convention held at Washington, D. C., last June, from which a part of this paper is borrowed, Dr. Salmons called attention to the fact that the old idea that only 3 or 4 per cent of the cattle about Washington were infected by tuberculosis, has been proven to be incorrect, since an examination of a herd of 100 head has shown that 80 of the cattle were infected by this disease. Physical examination alone is not sufficient to demonstrate the presence or the absence of tuberculosis. The tuberculin test is the only reliable means of discovering the disease when it is in the insipient stage. Even this sometimes fails on the first test, but a second test is pretty certain to succeed. The test is easily made.

The herd is kept in over night, and in the morning the temperatures are taken per rectum. This is continued every two hours for twelve hours. At the end of the twelve hours, 30 m. (2 c. c.) of Koch's tuberculin is injected hypodermically, and the cattle are allowed to rest over night. The next morning the temperatures are again taken, and continued to be taken every two hours during the day (12 hours). A cow's temperature is about 101 degrees F., and if any have tuberculosis, the temperature will rise to 105 or 106 degrees F. The cattle are well fed and cared for during this time, but kept quiet.

This method has been so thoroughly tested that it is now employed by the State Board of Health of New York, in which State the matter is receiving great attention. The National Department of Agriculture at Washington is also taking active measures in reference to this matter and supplies to State veterinarians, free of charge, the material necessary for making the tuberculin test.

It is the candid opinion of the writer that if this subject were appreciated as it should be, and such measures adopted as might be adopted, and such as would be adopted if the people fully appreciated the gravity of this subject, tuberculosis, not only in cows, but in human beings as well, might be practically stamped out of existence within a generation.

If this could be accomplished, it would result in the saving of a vastly greater number of lives than have been saved by quarantine and vaccination against cholera, yellow fever, and small-pox.

Co-operation on the part of national, state, and municipal governments in making investigations of this sort obligatory, and furnishing facilities for such investigations, would, I believe, result in the saving of many thousands of lives annually, and might, within a few years, almost wholly eradicate a very important and rapidly inceasing cause of tuberculosis in human beings.

The conditions under which milk is usually produced in civilized communities are such as to insure its contamination. The udder and other

portions of the body of the cow become smeared with her excreta, or that of other animals, and this infectious material is in turn rubbed off by the contact of the hands or the clothing, or the switching of the animal's tail, and falls into the milk during the process of milking. The amount of foreign material of this sort which finds its way into the milk depends, of course, very largely upon the condition in which dairy cows are kept, as well as upon the care of the dairyman. Milk from cows in pasture is comparatively free from materials of this sort, although by no means wholly so, while milk from cows kept in stalls is certain to contain a considerable quantity of stable litter.

The average dairyman unwittingly imitates a heathen custom. The Hindoo, as already stated, makes no use of milk as an article of food, but often keeps cows for the purpose of supplying milk to his English and Mohammedan neighbors. The rules of his religion, however, require him to placate his deity for robbing the cow by performing certain religious rites, one of which consists in adding cow dung to the milk.

Incredible as this statement may appear, I am certain it is authentic, as the statement was made to me by missionaries who had spent many years in India and were personally knowing to the facts.

I was also informed that a great objection to the use of milk in India is the fact that it is invariably found to possess a strong flavor of cow dung.

This objection not infrequently applies with a considerable degree of force to United States milk.

When it is considered that in the cow's excreta are to be found germs of many varieties, from the ordinary germs of putrefaction to the most deadly pathogenic or disease-producing microbes, and requiring only a favorable soil in which to develop to enable them to manifest their deadly properties, it will be seen that no small importance attaches to what is generally considered an insignificant or unimportant matter.

The housewife is ordinarily contented with straining the milk through a wire cloth strainer, or, if exceptionally fastidious, she may employ a strainer of cloth. The universal practice of straining milk in some fashion is a recognition of the source of contamination which has been mentioned. But it probably is not generally known, or at least not considered, that this mode of purification removes from the milk only the coarser masses such as are readily visible to the eye.

A microscopic examination of the milk obtained from a cow in the ordinary manner shows that after the most careful straining it still contains a large number of germs and germ spores, which at the end of a few hours are found to have increased with such rapidity that thousands are to be found in every drop of milk, and at the end of twelve hours the number is often increased to millions.

It is to these germs that the souring and decomposition of milk are due, and also the various characteristic changes which take place in cheese, and other less usual phenomena connected with milk.

Pasteur, Freudenreich, and many other eminent bacteriologists have made a careful study of the different germs found in milk, and with most interesting results.

Investigations conducted a few years ago at the experiment station of the State Board of Health of Connecticut, resulted in the discovery of more than thirty different kinds of germs in milk.

In conclusion I desire to say one word with reference to proper methods in the production, care, handling, and use of milk:

1. Cows must be fed upon proper food. Cows fed upon garbage soon suffer from indigestion, and the milk is thereby deteriorated in quality, not only by the poisonous products of decomposition communicated by the garbage through the cow to the milk, but also by the products of indigestion in the cow, which are equally deleterious in character, and which find their way into the milk from absorption and secretion by way of the mammary gland.

2. A cow must be supplied with an abundance of pure water. The same care should be taken to provide as pure water for a milch cow as for a human being.

3. The milch cow should receive most scrupulous care as regards cleanliness. When a wet-nurse is to be selected for a young child, the nurse is usually required to bring a certificate from a physician that she is in sound health. A wet-nurse suffering from a skin disease, serious indigestion, decayed teeth, bad breath, or a constitutional taint of any sort, or who is of untidy habits, is at once rejected.

It is very remarkable indeed that we have been so slow in recognizing the fact that a cow is a wet-nurse for the entire family—the father, mother, older brothers and sisters, as well as the infant members of the family. The cow should be kept indoors only during the coldest weather, and should have daily exercise out of doors in all weathers. The stable should be airy and well ventilated, thoroughly clean and free from stable odors; the cow herself should be kept thoroughly clean, and unless allowed an opportunity to groom herself in a natural fashion, should be as regularly and thoroughly curried as a carriage horse. Before milking, all the parts liable to contribute anything to the milk pail should be thoroughly clean.

4. The dairyman himself should be neat and tidy in his work. The vessels which receive the milk should be protected, so far as possible, from stable dust. In the investigation conducted at the Connecticut experiment station, among the germs found in the milk was one species which produced the familiar characteristic odor of the cow pen, another gave that of a chicken coop, another produced the odor of the pig sty. The odors produced by other germs were equally characteristic of their origin.

To avoid the reception of germs and the absorption of poisonous volatile substances produced by the various germs which thrive in the vicinity of stables, the milk should not only be protected while in the vicinity of the milking stable, but should be removed as quickly as possible.

5. The milk should be quickly cooled after milking; not that there is anything injurious in the animal heat in the milk, but heat favors the development of the germs which, in spite of all ordinary precautions, are certain to be present in small numbers at least, while cold discourages the development of these organisms. A certain period of incubation takes place after the collection of the milk from the cow, varying in length from an hour or two to several hours, according to the temperature of the milk.

Experiments made in Germany have shown that milk which is cooled rapidly after milking, so that the period of incubation is sufficiently extended to allow of the consumption of the milk before the incubation is completed, is much less likely to produce disease than milk in which this precaution is not taken. The observations referred to were made upon a large number of children fed upon milk from various sources and treated in different ways. In all cases in which sickness could be traced to the milk it was found that the precaution of cooling the milk had been

omitted, while those infants who were fed with milk which was promptly cooled after milking and kept cool, were almost wholly free from disturbances from this cause.

Cases of tyrotoxicon poisoning have been traced to the neglect of this precaution.

6. The milk-containing vessels themselves may be a source of contamination of milk. This is a matter with which every housewife is acquainted.

Milk put into vessels which have not been properly scalded, promptly sours. Such milk, even though it is eaten before souring or other decomposition has occurred, is likely to produce disease in young children and other persons of feeble digestive powers, as the process begun in the pan is continued in the stomach. This is one of the reasons why milk fresh from the cow frequently agrees with invalids or with young infants when milk can be taken under no other conditions without injurious results.

If the above mentioned precautions are adopted and care is taken to ascertain that the animal from which the milk is taken is in a fairly healthy condition and remains in a healthy state, no danger may be apprehended from the use of milk; but until the general public have become much more thoroughly educated upon this subject than is likely to be the case for some time to come, a wise precaution which may be safely adopted as a routine practice in the use of milk is sterilization or Pasteurization.

Sterilization consists in raising the temperature of the milk for a few minutes to the boiling point, or a few degrees higher. If the milk is heated to the boiling point or a temperature of about 210 degrees for a few minutes, all deadly germs and most other germs will be destroyed.

A few spores, however, are almost certain to escape, so that milk which has been merely boiled will not keep indefinitely.

For this, it is necessary that the temperature should be raised several degrees above the boiling point, or to about 220 degrees and held at this piont for ten to twenty minutes. The higher temperature named may be obtained by placing the milk in bottles, tightly corking, and boiling while immersed in a saturated solution of common salt. It is necessary to leave the bottles in the solution until it is cool, as they will break if suddenly removed from the hot solution.

Objections have been raised to sterilization on the ground that it changes both the flavor and to some degree the composition of the milk at the same time that it destroys the microbes which it contains. To meet these objections the method known as Pasteurization has been proposed. After using this method on a large scale for several years, I can heartily commend it. It consists in heating the milk to a temperature of 158 degrees and keeping it at that point for fifteen minutes. Exposure for this length of time to the temperature named will destroy typhoid fever germs, and all other disease producing microbes which are at all likely to be found in milk, although it will not destroy all germs capable of souring milk or producing other forms of decomposition. The germs which produce decomposition of casein, such as takes place in the formation of cheese, require a temperature above that of boiling water. Pasteurization consequently cannot be depended upon for the long preservation of milk, but when carefully done, it is found that milk thus treated will keep from one to two days longer than raw milk. By the daily repetition of the process it is, of course, possible to preserve the milk practically unchanged for almost an indefinite length of time.

It should be mentioned that it is important to cool the milk rapidly after heating, as Pasteurization merely prolongs the period of incubation or development of many of the germs which it contains, and it is important to maintain as low a temperature as possible after the heating, as heat greatly favors the process of incubation, or development.

This method of treating milk preparatory to using it is by no means as troublesome as it may appear. There are no obstacles whatever to its practical adoption on a small scale in private families, and its use on a large scale is not a matter which offers any considerable difficulties. For the last five years I have had Pasteurized or sterilized all the milk consumed in the institution of which I have charge, amounting to 1,200 to 1,500 quarts daily, and the work has been accomplished by very simple arrangements. After the removal of the cream with a centrifugal separator, the milk is heated in large double boilers and afterwards placed to cool in ordinary creamery tanks furnished with long, narrow receptacles.

So far as I can learn from inquiry, the milk supply of Union City is essentially that of most interior towns, neither better nor worse. It is certainly much superior to that of our large cities, but it is exposed to all or at least most of the dangers which have been pointed out in this paper, and doubtless is responsible for a certain proportion of the deaths which annually occur in the community.

The most serious dangers to which attention has been called are not those of an extraordinary character, such as cholera, typhoid, and other epidemic infections, but the ever present danger of infection from tuberculosis and to injury from the deleterious effects of the germs constantly present in milk collected and used under ordinary conditions.

If some of the conclusions of this paper seem to be overdrawn and the recommendations impracticable and fastidious, I shall neither be surprised nor offended, for the history of sanitary progress shows that at every advance step in the direction of improved hygiene this same obstacle has been met and surmounted.

VENTILATION AND HEATING.

BY DR. MARK T. CLAY, UNION CITY.

Ventilation involves two ideas: One, the supply of fresh air, and the other the removal of vitiated air: Accordingly, two openings should be considered. If an open fire place exist in the room it, in connection with some opening to admit fresh air, would in all probability, be satisfactory. Fresh air may also be introduced into dwellings by mechanical means, namely, by the so-called impulsors. The pure air is derived somewhere near the house, and conveyed to the ventilator which diffuses it through canals into every corner of a room. The impure air escapes through fissures in windows, doors, walls and ceilings. And if, in connection a corresponding system of suction canals be arranged, the effect is the greater, and the division of air is under complete control. The dust may be carried away with vitiated air. The circulation of the air is effected by the fresh air

entering at the top of the room and sinking downward, while the impure air, together with any falling dust, is sucked out at the bottom of the room. More thought is given to the subject of ventilation during the fall and early winter than any other time of the year. In the summer time windows and doors are wide open and the air circulates freely through the houses, stores, offices and all other enclosures, but with the first coming of cold weather down goes the windows, and slam goes the doors, and the people immediately begin to suffer from drowsiness, nausea, headache, faintness, and all the other ills that attend the breathing of impure air. This brief season between summer and winter is the most trying period in the whole year, and is much worse than the corresponding time in the spring, for by the latter time people have become used to breathing foul air, and then artificial heat is continued till summer heat arrives, and so makes it possible to open windows in the intermediate time of cool weather.

But in the fall all this is different for heat from furnaces, stoves and boilers is economized till the last moment, and in the meantime every cool air entrance its kept sealed lest some one suffer from a chilly draft.

When winter arrives the conditions become changed. The furnaces and indirect radiators deliver large volumes of fresh air into the rooms, and where the direct heating systems are employed the plentiful supply of heat makes window and door ventilation possible without discomfort. The breath of life in a physical sense is pure air, and of this there must be a plenty. Home ought to furnish the restorative agencies, for the place of toil or business cannot always be of health-giving character. Toil, of whatever character, is exhaustive of life's forces. But on our homes where a part of the day, and all of the night is spent, very little attention is paid to their construction in regard to ventilation. Doors and windows, with an occasional transom has been deemed sufficient. That fresh air in plenty may be had requires a more careful arrangement. The old-fashioned house with its open fireplace in every room, was a more practicable provision. And this reference suggests the only specific recommendation we care to make, namely, every dwelling of more than one story in height ought to have a ventilating shaft, or chimney, into a separate compartment of which every room should have an opening. The construction and connections of such ventilating shafts need not increase the cost very much, if the plan were properly made; and in cases of sickness this additional facility in the sick room would often make the difference between continued illness and recovery.

The paper on "Ventilation and Heating" by Dr. Mark T. Clay, was not read at this time, but is inserted in the proceedings here in its proper order.

VENTILATION AND HEATING.

DISCUSSION, BY HON. FRANK WELLS, PRESIDENT STATE BOARD OF HEALTH, LANSING.

[ABSTRACT.]

The subject of ventilation and heating is of so great importance that I greatly regret that we are to be deprived of Dr. Clay's paper. As compensation in some degree for this loss I trust the discussion I am expected to open will be continued by others better qualified than myself to show you its value.

Air and heat are two necessary elements of life in nearly every form. How to secure the first in a pure condition, and the last most economically, constitutes the problem of ventilation and heating. The problem is complicated by the fact that, it is not only necessary to secure pure air; but it is equally important to dispose of foul or used air.

Each person should be supplied with 2,000 cubic feet of fresh air per hour. This air when expired carries with it from the lungs carbonic acid, and leaves a portion of its oxygen. Inhabited rooms, therefore, in which there is no provision for the exit of used air, or the admission of fresh air, are continually having their atmosphere charged with carbonic acid and its oxygen consumed. Such air is also laden with a peculiar animal vapor, readily recognized by its odor, and always perceptible in crowded and poorly ventilated rooms. Both carbonic acid and this vapor, are poisonous and cannot be inhaled with impunity for a great length of time even by the strongest and healthiest human being.

Air rendered deleterious by these additions and deprived of its life producing element, oxygen, is always dangerous and often fatal.

But this is not the only condition which may render the air of human habitations dangerous to human health and life. The minute organisms which are the cause of all dangerous communicable diseases, find lodgment upon walls, furniture, carpets and all the other surfaces in rooms where persons suffering from such diseases may have been. Many of these organisms retain their virulence for months or years. Some, like the *tubercle bacillus*, the cause of consumption, become spores. In this condition their vitality seems practically unlimited. They float when disturbed from their lodgments in a room, in its atmosphere, ready to renew their work of destruction and death when again brought into contact with human tissue.

In their spore form the best known disinfectants that can be used in a room, may not destroy the life of these organisms. Safety lies in the direction of ventilation, or the substitution of fresh outside air for that which has become contaminated. This may be accomplished in warm weather by the opening of windows and outside doors; but in cold weather, when the dangerous communicable diseases are most prevalent, this method is impracticable. The only correct theory for this purpose in cold weather, for either residences or places where people congregate in large numbers, is to bring into them, from the outside, air properly heated in sufficient quantities, and to provide means of egress for an equal amount of impure air.

In larger public or private buildings the hot air furnace, steam, or hot water are the modern methods of heating most usually adopted. Either of these when accompanied by sufficient fresh air and suitable ventilation, fulfills all the requirements of our present knowledge.

It is probable however, that outside the larger cities more than nine-tenths of the residences, public halls, schools and churches, are heated by stoves intended to warm the air of the rooms without attempt or thought of fresh air or ventilation. It is true that in the more pretentious modern residence is often found the grate or fireplace. Much better than no ventilation. The objections to these are that they carry off both pure and impure air, create drafts and greatly increase the cost of fuel. An admirable method of supplying fresh air to rooms both public and private, heated by stoves, is to surround the stove with a metal jacket open at the top and extending from the floor to about the top of the stove. Air is conveyed by means of a pipe under the floor to the space between the jacket and the stove where it becomes heated before entering the room. By this means pure air is brought into rooms in any quantity desired, properly warmed. Ventilators to remove impure air under this plan of heating, or any other, should always be at the floor level. Their capacity should be fully equal to the volume of fresh air brought in, and they should be located in an inner wall or in some way warmed to promote a constant outward flow of air. Heat expands air, causing it to rise, while the denser cold air falls to the floor and is that which is removed when the outlet is at this level. An unventilated room has usually a body or lake of cold air upon its floor, when, at the same time, the air a few feet above is quite warm. The feet of the occupants of such a room are in this lake of cold air while their heads are in the higher heated air. In the interests of both health and comfort this condition should be reversed and may be modified only by the kind of ventilation I have suggested.

In the construction of public halls such as this, in churches, and especially in schools where so much of the time of our youth is spent, and where the danger from contagious diseases is greatest, the subject of ventilation and heating, while of the greatest importance, usually receives little attention. A lack of knowledge is the only explanation of this, for a proper system of ventilation and heating is not only valuable from a sanitary standpoint; but is equally valuable from an economic one. Such a system not only promotes health and saves lives; but it also saves fuel. In the light of our present knowledge the subject is of great importance; and I hope that further discussion will show to you much more clearly than I have been able to do in these brief remarks, its very practical value.

The program called for a paper by Dr. Clisbe during the first session; but as he could not be present during the first session, the paper was here read, as follows:

THE GERM THEORY OF DISEASE.

BY S. H. CLIZBE, M. D., COLDWATER.

Today all or nearly all diseases are supposed to be caused by micro-organisms. Bacteria-micro-organisms, microbes and germs are synonymous terms for certain minute microscopic vegetable organisms, which, when introduced into the living body produce disease.

These disease producing bacteria vary in diameter from $\frac{1}{1000}$ to $\frac{1}{4000}$ of a millimeter in diameter, and are composed largely of an albuminoid substance technically called mycoprotein. Each bacterium is a cell, and has the power of germination or reproduction, when surrounded by the necessary conditions for its growth. At one time it was claimed that bacteria belonged to the animal kingdom, for the reason, I suppose, that some of them were seen to possess spontaneous movements; but now I think it is pretty generally agreed that they are minute plants.

Buchner claimed that by cultivation in different media he was able to transform the most dangerous bacillus into the most harmless, and again the most harmless into the most dangerous. But cultivation and inoculation experiments on a large scale by the most careful observers have shown that such changes never take place, but that each microbe always retains its shape and effect on the living body, *i. e.*, each disease is caused by a certain particular microbe and that microbe will always cause that disease and nothing else.

Many species of bacteria multiply with great rapidity, in tissues presenting favorable conditions for their growth, at the temperature of the body. They multiply by segmentation or division of the microbe, or by spores or by both methods, *e. g.*, the bacillus of anthrax, or carbuncle multiplies by division in the body, and by spores outside of the body. According to Cohn, if it requires one hour for a complete division or segmentation, and for the new microbe to attain maturity, a single microbe in one day would produce sixteen millions of microbes, and at the end of the second day the product would represent two hundred and eighty-one billions in number.

The spores of bacteria are analogous to the seeds of flowering plants; each spore develops into a bacterium, and thus one crop after another is produced in rapid succession.

It is of practical importance to know how bacteria and spores may be destroyed.

Wherever practicable it is safe to say that they may be destroyed by heat.

The thermal death-point has been determined as applied to many different microbes, and found to be as low as 129 degrees in some; and there are none, I think, but what are destroyed by 212 degrees of heat, which is the boiling point. It requires a greater degree of heat to destroy the vitality of spores than to destroy the vitality of bacteria, and the same is true in the use of germicidal agents.

But what knowledge of real benefit, and practicable to the people outside of the medical profession, are we to get from this "germ theory of disease"? It is this, first that all diseases are caused by germs. We should try to

learn what the cause of each disease is, how it enters the body, how to prevent it from entering the body, and how to destroy it, both in and out of the body. For example, the microbe of typhoid fever is in the bowels, and there is where it does its work of destruction, and it is cast out of the body in the passages from the bowel, and if we see to it that the matter from the bowel is destroyed, either by germicides or being buried at once, there is little danger from contagion, for there is no contagion from the breath, the urine, or the perspiration, but there is danger in the bowel discharges. Again we should learn that the contagion of diphtheria is from the mouth and air passages, hence everything coming from that source should be at once destroyed; and burning is the better way. In this way we learn that sickness is, to quite an extent, something under our own control, and for the continuance and spread of which we are very largely responsible.

SCHOOL SANITATION.

BY PROF. H. W. MC INTOSH, UNION CITY.

(Reporter's Abstract).

I deem the question of school sanitation one of great importance, and those who know how the school building is heated and ventilated know the condition in which we exist. (A description of the system of heating and ventilating in the Union City School building was here given.) (The manner in which light came into some of the rooms was also mentioned.)

The light which comes into the room should be mellowed. Opaque shades should not be used; they should be translucent, and the light passing through them will be mellowed.

Children also require physical training and exercise. We hear some parents say "My child needs rest. He is over-worked in school." Now parents, this is the child that needs physical exercise.

Give me the boy who rises early, eats his breakfast and spends an hour or two at the rail pile. He is the one that comes into the school room with rosy cheeks, and is ready to solve the hardest problem in arithmetic.

Do not think because he has studied in the evening that he needs to sleep late in the morning and eat his breakfast and walk to school, this is not right. He will be stupid and unfit for mental work unless he has plenty of physical exercise.

In the lower rooms we have calisthenic exercises. No child can sit all day or as many hours as there are in a school day without getting fidgety and nervous, and for that reason they must have different kinds of work and exercise.

This is not an age of deterioration as has been stated. The boy of 16 or 17 years today cannot get into the armor worn by an adult 600 years ago.

Give us well ventilated, well lighted school buildings, churches, etc., good active boys and girls and we will not contribute to a nation of invalids.

DR. M. T. CLAY—As this is a Sanitary Convention and it is already very late and we have listened to some very interesting and instructive remarks, I think it would be well to adjourn and rest before the next session, therefore I make a motion that we adjourn.

The motion prevailed.

FIFTH SESSION, FRIDAY, OCT. 26, AT 8:00 P. M.

THE WATER SUPPLY OF UNION CITY.

BY PROF. N. P. COLLINS, UNION CITY.

The desirability of a convenient and abundant supply of pure water for drinking and culinary purposes is readily and fully admitted by all intelligent persons.

But very few persons know when they have pure water, for it may *appear* clear, odorless and pleasant to the taste and yet be charged with organic matter to such a degree as to be very injurious to health without its deleterious nature being recognized.

Steele* says:—Water "composes perhaps four-fifths of our flesh and blood. Man has been facetiously described as twelve pounds of solid matter wet up in six pails of water. All plumpness of flesh and fairness of the cheek are given by the juices of the system. A few ounces of water and a little charcoal constitute the principal chemical difference between the round, rosy face of sixteen and the wrinkled, withered features of three score and ten.

"To supply the constant demand of the system for water each adult in active exercise needs about three pints per day, or over half a ton annually."

Considering then the absolute necessity of water in some form, not only to preserve health but also life, and the difficulty of detecting some of the most deleterious substances in it, how important to all is the subject of water supply.

There are some fallacies in regard to the purifying powers of nature over impure water that must not be passed by.

First, It is claimed that the filthiest water by passing through a few feet of earth will be completely purified, and the filter is instanced as an example.

Now it must not be overlooked that the filter, after a few months of use must be cleaned, as it becomes so filled with the substances filtered out of the water run through it as to be unfit for use. So the ground, while for some time a good and sufficient filter, will in time become so filled with organic matter, if adjacent to a large supply of such organic matter as is supplied by privies, cesspools and barn-yards, or a cemetery, as to be like a sponge filled with dirty water—not only unable to filter out impurities in the water passed through it but actually to contaminate pure water brought into it.

Dr. Victor C. Vaughan, Ph. D., of our State University, in his treatment of the subject of "Water Supply" at the Ypsilanti Sanitary Convention, July, 1885," said:—(page 66.)

* Steele's New Chemistry, pp. 57-8.

"It is a popular belief that if water filters for any distance through the soil it is purified. This is an erroneous belief.

* * * * * * * * * * * * * * *

"In order to ascertain to what extent soil was contaminated with privy-vaults, I dug down near a privy-vault which was situated on the outskirts of the town and isolated so that there were no other known sources of contamination around; I dug down a foot behind this privy-vault and took up some soil three feet below the surface to determine the amount of organic matter in it, then I went off six feet and did the same thing, then 12, then 1, then 21, then 30 and without going into detail, suffice it to say that the contamination of the soil from that single privy, built upon nearly level ground could be detected 50 feet from that vault plainly."

Prof. Jas. H. Shepard, Instructor of Chemistry in the Ypsilanti High School, said:—(p. 70.)

"I venture to say that not one person in fifty knows at what distance he lowers the level of the ground-water when he lowers the water in his well by excessive pumping. It has been demonstrated that, in soils somewhat similar to ours, the level of the ground-water is lowered for a distance of 200 feet in all directions from the well, while under the most favorable conditions the circle of influence may have a radius of over 2,000 feet. (Nichol's Water Supply, pp. 109-114.)

"Now, for sake of illustration, let any owner of a well in this town take a line 200 feet long and, with his own well as a center, let him strike a circle, then let him count the privy-vaults old and new, cesspools old and new, and all other sources of pollution within that circle; then he may know approximately, upon how many reservoirs of death he is drawing when he works the handle of his pump."*

After a series of experiments upon the "filtering capacity of soil," in their "report for 1882, p. 582," the National Board of Health state:

"From these results it appears very clearly that sand interposes absolutely no barrier between wells and the bacterial infections from cesspools, cemeteries, etc., lying even at great distances in the lower wet stratum of sand."

As to the infecting power of a cemetery, it will suffice to mention the famous case at Richland, Kalamazoo Co., Mich., where the village board chose a site for a cemetery within the village limits, and within thirty rods of a well, owned by an old physician,—Dr. Patchin.

Of this case Dr. Vaughan said:†

"The old doctor objected to the location of the cemetery so near his house and well, and as a result of his objection there was a law suit, and if you will pardon me I will mention something of the condition of the land and some experiments that were made. There were some 18 inches of rich prairie loam, and then below this some two or three feet of hard-pan, below this were 18 or 20 feet of gravel such as we have all through the southern part of Michigan. In digging the graves, the bodies would be put into this gravel. The gravel was so loose and so moist that in digging graves it was necessary to put in boxing to prevent the gravel from pouring in while the grave was being dug. Below the gravel and about 30 feet below the surface was an impervious bed of clay, with a slope from the cemetery towards the well. It became a question now as to whether there was a possibility of the contamination of this well from burying bodies in the proposed new cemetery. I was called, and after studying the geological formation, concluded there was a possibility of such contamination. The well was pumped dry twice a day, and on an average 15 barrels taken from it at each pumping. To show how ridiculous some theories are that have been advanced upon that subject, I will state that I was met in court with this statement: That it would be impossible for any of the water or rain falling upon this cemetery, thirty rods distant to reach the well, because, as was found in some old book, all the water that goes into a well is that which falls upon a surface which will be enclosed in a circle whose center was the mouth of the well and whose radius was the depth of the well. This statement was made independent of any lay of the land or the geological formation, and without any consideration whatever of the structure of the surrounding country. Fortunately this

---

* Proceedings of the Ypsilanti Sanitary Convention, July, 1885, p. 70.
† Proceedings of the Ypsilanti Sanitary Convention, July, 1885, pp. 66-67.

can be met very easily. Thirty barrels of water were pumped from the well each day. We know the amount of rainfall in Michigan per year and we can calculate very easily the number of barrels that would fall upon this surface enclosed in a circle whose center was the mouth of the well, and whose radius was the depth of the well, and as the result of such a calculation, we find that the amount of rain falling upon this surface during the year would not supply the well more than two or three days. Returning home and detailing the trip I had had to Dr. Langley, he suggested that a direct experiment might be made to see whether matter would pass from the proposed cemetery to the well or not. He tested the water of the well for lithium, a substance easily detected, found it was absent, and then had a salt of lithium sown over the proposed cemetery, and then examined the water of the well each day thereafter; and on the eighteenth day after the lithium was sown over the cemetery it was found in the water of the well, showing that the water that fell upon the cemetery did unquestionably penetrate the soil, pass down to the impervious bed of clay which was the water-shed upon which the water in the well collected, and thence into the well. Notwithstanding proof so positive as this, a learned judge in Michigan dismissed the case and allowed the cemetery to be located there, with the possibility of poisoning a number of families. As a result the families of the neighborhood had to discontinue the use of their well-water."

Another very common fallacy is that water purifies itself in freezing. Dr. O. W. Wight, Health Officer of Detroit, said:—*

"The ice question is simply the drinking-water question. Ice is simply frozen water, and as Nichols, the best chemist in Massachusetts and one of the best in this country, says, no ice should be used that is cut from water that is unfit for a public water-supply. That is the one test. See where your ice is cut, and if it is cut on water that is not fit to drink, do not touch your ice. It is an old delusion and a snare that water is purified by crystalization, by freezing. It is to a very little extent. It depends upon circumstances to what extent.

"Common salt will, to a very considerable degree, be precipitated by freezing water, organic matter a good deal less, and germs of disease, I think, not at all. Even common salt will incorporate itself with water in freezing so that it will not simply be imprisoned in the ice crystals, but will be an organized part of the water itself. The best chemists will confirm this statement. So do not take ice from water that is not fit for a water-supply, and remember, too, that chemical analysis, either of your water or your ice, cannot tell you everything, in fact it does not tell you as much as you think it does. The microscope cannot tell you everything. Disease germs, the germs of small-pox, of scarlet fever, of typhoid fever (I mean the real enteric fever) cannot be detected by chemistry nor by the microscope. You may have the germs of typhoid fever shut up in your ice, and your chemists and your microscopists cannot detect it."

Prof. J. W. Langley, then of our State University, said:†

"While it is the general impression that ice is free from contamination, it has been recently demonstrated beyond the possibility of a doubt that these low forms of organization on which the spread of disease is known to rest very largely are not killed by freezing. I received five days ago a report of a series of experiments that has been made at the University of Edinburg to test this very point, and there infectious material was submitted to varying degrees of cold, ranging from the freezing point down to 80 degrees below zero, Fahrenheit. The materials kept for one week at -80 degrees, were then thawed out and found to be just as deadly as before they had been frozen. I think we must accept these statements as being authoritative and settling this one point that freezing does not kill these low forms of life, that freezing does not practically purify water."

As a result of a series of careful investigations, carried on for many years not only in this country but also in Europe, it is now considered practically settled that *typhoid fever* and *cholera* are the direct result of disease germs entering the body generally through impure water.

Erwin F. Smith, in a long and exhaustive article on "The Influence of Sewerage and Water Supply on the Death-Rate in Cities," says of typhoid fever:

---

* Proceedings of the Ypsilanti Sanitary Convention, July, 1885, p. 38.
† Proceedings Ypsilanti Sanitary Convention, July, 1885, p. 48.

"So far as I can learn the cities which have no sewerage or proper water-supply are scourged by cholera and typhoid fever as badly today as were the general run of cities twenty or thirty years ago, putting aside, of course, those yearly fluctuations of the typhoid mortality, always more or less noticeable and dependent upon seasonable and other influences."*

Erwin F. Smith also said:—

"If we turn from groups of towns to individual cities, we find the highest typhoid fever mortality in those in which the greatest carelessness prevails as to the disposal of the night soil."

Dr. Henry F. Lyster, of Detroit, said:—

"It has been found that material that is innocuous at first, after a few hours, twenty-four or forty-eight, becomes a virulent poison. This is noticeably the fact in typhoid fever and in cholera."

Erwin F. Smith further said of cholera:—

"The infective material of cholera is derived from the bowel discharges, and is taken into the human system through the air we breathe, the food we eat, or the fluids we drink. It spreads therefore in a manner similar to the typhoid poison."

"According, also, to Dr. Emmerick. * * * * Dr. Spetuzzi found in his investigations at Naples that cholera was most apt to strike, not the dirtiest houses, but those standing on the filthiest soil."

The past and present water-supply, for drinking and culinary purposes, in Union City is derived from wells. Most of these have iron pumps and are either what are commonly known as "drive wells" or the iron pipe is put down in the center of the well which is of the usual size and made of common red building brick, or of water lime, curved well-brick but not laid with mortar.

I do not know of a fountain within or near the city limits and do not think any cistern water is used for drinking purposes.

Samples of water from many of the wells in the village were analyzed, some six years ago, by Prof. Walter S. Hewitt, then Principal of our Public Schools, and the water in some of them was found unfit for use as drinking water. But within the past few years the process of pollution from the great number of privy vaults old and new,—none of which have been found to be cemented vaults,—also from the cesspools and barn-yards,—many of them within fifty feet of the wells,—may have gone on so rapidly that the water which was pronounced bad, then, may be very bad now, and those wells that were found good, then, may be sources of disease now.

In order to ascertain the general purity of our present water-supply samples of water from three wells on the north side of the St. Joseph river, at considerable distances from each other, were sent to Prof. Delos Fall, of Albion College, for analysis.

Sample No. 1 is from the well on the premises of J. J. Banford which is made of brick and has an iron pump in it. It is 63 feet northwest to the privy vault, 70 feet northeast to the refuse pile of the old barn and 50 feet from the refuse pile of the new barn, adjacent, and 45 feet west to the cesspool which is cleansed twice a year.

Sample No. 2 is from the well on the premises of W. H. Hubbard. It is 40 feet deep, laid with well-brick, without mortar between, and has an iron pump attached. It is 75 feet north to the privy vault, with another privy just back of it, and only 40 feet from the refuse pile of the barn yard.

* See also "outbreak at Sioux Falls, Da. Ty.," as given in the report of "Ypsilanti Sanitary Convention, July, 1885," p. 96. Also, see "Outbreak at Plymouth, Pa.," given in same report, p. 97.

McMILLAN CHEMICAL LABORATORY, ALBION COLLEGE. } *Albion, Mich., Oct., 23, 1894.*

Analysis of Water from Union City, Mich.

	Sample No. 1.		Sample No. 2.		Sample No. 3. From Prof. Collins.	
	Parts per million.	Grains per U. S. gallon.	Parts per million.	Grains per gallon.	Parts per million.	Grains per gallon.
Chlorine	43	2.407	18	1.0494	7	.4081
Albumenoid ammonia	.22	.0128	.17	.0099	.12	.0070
Free ammonia	.1066	.0062	.06	.0035	.08	.0047
Hardness, temporary	57.14	3.331	85.7	4.996	121.43	6.979
Hardness, permanent	100	5.83	114.3	6.664	92.85	5.413
Hardness, total	157.14	9.16	200.0	11.660	214.28	12.392
Nitrates	10	.582	Large am't	....	1	.058
Total solids	832	48.506	516	30.082	350	20.305

No absolute standard for the chemical purity of drinking water can be given, but good authorities agree as follows:—

1. The chlorine ought not to exceed 10 parts per million.
2. The free ammonia ought not to be more than 0.05 parts per million.
3. If 0.10 of a part of albumenoid ammonia be present in the water, it should be regarded with suspicion and the presence of 0.15 of a part, or more, of this substance should certainly condemn the water.

Sample No. 3 is from the well on the premises now occupied by Andrew Lucas, west of the cemetery. It is a "drive-well" about 25 feet deep, 15 feet south of the privy, which has no vault, and 324 feet from the west end of the first row of graves which are mostly the oldest ones.

There is a slope of the surface of the ground, of about six feet to the west between the row of graves referred to and the surface of the ground where the well is situated. There is also a barn yard with a small refuse pile about 100 feet to the east of the well.

Seven samples of water from as many wells in different parts of the village have been put into the hands of Mr. Ed. A. Hayden for test as to the presence of organic matter, simply.

Without attempting to distinguish between the organic matter as derived from animal or from vegetable substances—which the apparatus at his command was insufficient to enable him to do—his tests show that on the basis of the number of milligrams of oxygen consumed per litre,

Sample	No.	1	required	2.32	milligrams
"	"	2	"	.554	"
"	"	3	"	1.77	"
"	"	4	"	2.324	"
"	"	5	"	1.66	"
"	"	6	"	2.544	"
"	"	7	"	2.656	"

From Mr. George Stevens, who has had years of experience in making and cleaning out wells in this village and the vicinity, I learn that on the north side of the river no clay is found until at about the level of the river bed, the subsoil generally being loose gravel.

The well in the cemetery is a drive well somewhat less than 40 feet deep, going down through loose gravel for 30 feet, then, for the remainder of the distance, through moderately hard reddish clay, says Mr. Stevens.

From the testimonies of the various authors quoted in this paper, as to the general principles which prevail concerning the pollution of the subsoil by privy-vaults, cesspools, barnyards and cemeteries. Also considering the loose gravelly nature of the subsoil on the north side of the river, where the largest and oldest part of the village is situated, you can readily imagine what the condition of said subsoil must be in this oldest part of our village, much of which has been settled for sixty years.

The analyses given by Prof. Fall and Mr. Hayden show the state of the drinking water in the wells examined, from which the purity of the water-supply generally, can be readily inferred.

As to the *future* water-supply of Union City, the voters have already decided that it shall be by a system of water works to cost about $20,000.

No one will dispute the absolute necessity of stationing the plant where an *abundant* supply of *pure* water can be obtained not only now but for the *future indefinitely*.

Whether the location of this plant "on the flats" where the present test well has been sunk through loose gravel for 33 feet to water in abundance, will furnish such a supply, without drawing from the river after it has been contaminated by the cemetery and the town, is a vital point to be considered. In any case, the public health demands that, after removing fully all existing excreta, all uncemented privy-vaults and cesspools be prohibited and no refuse be allowed to accumulate in barnyards or in the streets and alleys. Thus we shall prevent all future contamination of the soil from the surface, and of the air near it, and obviate, to a great extent, the liability to typhoid fever and cholera, especially.

Furthermore, frequent chemical tests of drinking water used, whether obtained from wells or the public water-supply, should be made and all impure water at once discarded.

WATER-SUPPLY OF UNION CITY.

DISCUSSION BY PROF. DELOS FALL, M. S., MEMBER STATE BOARD OF HEALTH, ALBION.

(Reporter's abstract.)

It occurs to me that before taking up this discussion, I might say a few words concerning some remarks I overheard last evening. The question comes to some of you "What shall we eat; what shall we drink?" And we may seem to you to be very radical in our views; but if you will stop to consider, we have not told you of a single disease germ in anything unless we have also told you how to destroy it before it was taken into the system. There was a time when the average man only lived to the age of 33 or 34 years, but as advancement was made in sanitary education, he lived to be 50 years old. What we wish to do is to aid in the work of sanitary education until the average man lives to be 100 years old.

What have the people of Union City been doing for the last fifty years? Have they not been erecting homes, churches, school buildings, etc., for their comfort and happiness? Yes. They have also wells for their water-supply, but how many of them have given a thought to the location of

their well, except for convenience. Let us consider for a moment how water gets into the earth. It falls as rain, and is filtered through all the cesspools and privy vaults and every other filthy thing on or in the earth above the hard pan which it finally reaches. Now if the water is used from a well, driven near these places, is it not safe to say the water contains impurities received from them?

Some water from three different wells in Union City was sent to me for analysis. I found that the water was not as bad as in some places the size of Union City. (Here the different wells were described and the various impurities found were mentioned.)

(Chart showing how the analysis was made was exhibited.)

I congratulate the people of Union City on the prospect of the new system of water-supply, and I hope with it you will soon have a good sewerage system. This will not cost a great deal after you get the water works. Then the danger of getting typhoid fever from impure water in your town will be dispelled.

Prof. Fall was asked the question—"Is hard or soft water the most healthful?"

Ans.: If well filtered, I should say soft.

THE PREVENTION OF TUBERCULOSIS.

BY E. H. HURD, M. D., UNION CITY.

MR. PRESIDENT—The subject which has been assigned to me by the committee for discussion this evening—The restriction and prevention of tuberculosis—is one which is of great interest both to the public and to the medical man; and, although every report of the proceedings of conventions like the one now being held contains more or less discussion upon this topic, its importance will not cease nor will the interest in it fail as long as this dreaded "white plague" continues to produce one-seventh or one-eighth of the deaths which occur within the borders of our fair State. This fearful scourge which invades alike the home of the peasant and the palace of the prince, claiming its victims from all grades and classes of mankind, is subject to no bounds of latitude or longitude and is equally fatal in all parts of the inhabited world. When a case of small-pox breaks out in a community everything is at once at a fever heat and a single case of scarlet fever or diphtheria is sufficient to almost create a panic in the village in which it may occur. Nevertheless this one disease, tuberculosis or consumption carries off every year more people than all the other three diseases combined as you can see from this diagram which I show you. Can anything be done to prevent a part at least of this fearful mortality? In order to answer this question intelligently we must seek first for the specific cause of the disease.

Prior to 1883 the specific cause could only be conjectured at. To Virchow the great German pathologist is due the credit of first believing in the communicability of the disease and to Villemin, who as early as 1864, believed from experiments, that it was an independent and infectious disease, and could be produced in healthy animals by introducing into their system tuberculous material.

The best minds of the world were now working upon this problem and attempts at infecting other animals were made in three different ways: First, by inoculation—the introduction of tuberculous matter under the skin; second, by feeding food infected with tuberculosis; and third, by inhaling of dried and powdered tuberculous matter, and it was found that by all of these means the animals had become tuberculous. The animals used were cows, goats, hogs, rabbits and dogs, and it was found that each of these was capable of contracting the disease. These and similar experiments were made by various observers at different times until there was no longer any doubt of the communicability of the disease and the opponents of the infection theory of the disease were forced to abandon their opposition. Up to this time the experiments were of that character to prove the communicability of the disease. Next the specific germ or seed of the disease was to be sought for.

Prior to 1882 a few observers had detected a micrococcus in the blood of animals which had died of tuberculosis and the belief was then expressed that these organisms were the specific cause of the disease. But it remained for the indefatigable Koch in 1882 to prove beyond a doubt that these micrococci were indeed the cause of the disease. Early in that year he read a paper before one of the medical societies of Berlin in which he described the micro-organism which he called the *Bacillus tuberculosis* and gave at length the experiments by which he had been led to believe this bacillus to be the cause of the disease. His views were at first bitterly assailed but they stood the closest scrutiny and finally triumphed over all opposition and are now accepted by every observer of note.

This bacillus is from 1-8000 to 1-12000 of an inch in length and its breadth is about one-fourth its length and is found in every organ in the body which is the seat of tubercular disease. It is found abundantly in the sputum of those affected with pulmonary tuberculosis. While it had been clearly shown that the disease could be communicated from man to the lower animals by inoculation the proof that it could in like manner be communicated from one man to another was wanting until the experiment of inoculating a man who had gangrene of one of the toes was made by several physicians of Syra in Greece. The man was doomed to die because of his persistent refusal to submit to the amputation of the toe. A careful examination of the lungs showed them to be free from tubercular disease. An injection of sputum from a consumptive patient was made in the left thigh. At the death of the man 38 days later quite a number of tubercles were found in both lungs. I am not aware that any other experiments of this kind have been made on man.

Another way in which tuberculosis may be contracted is by feeding upon food that has been infected. Calves, dogs, hogs, rats, guinea pigs etc., have all been fed upon matter infected by tubercles and with the result of producing the disease in the animals.

A third, and this by far the most common way of communicating tuberculosis is by inhalation of dried tubercular matter. Thus Toppenheimer produced the disease in animals by causing them to inhale dried and powdered sputum from a tuberculosis patient.

Primary tuberculosis of the lungs is undoubtedly contracted in this manner and it should be borne in mind that in the lungs is found the soil most favorable for the development and growth of the germ.

How does this germ find its way into the air? Carefully conducted experiments have shown that the germ will not leave the warm, moist surface

face of the lung and be thrown out with the expired air of the breath, but its usual mode of leaving the lungs is with the sputum which is coughed up. Examination of the dust scraped from the walls of rooms occupied by consumptives shows the presence of the bacilli, and tubercular disease has been produced by inoculation with this dust, showing that the bacilli retain their virulence after drying, and further experiments along this line have shown that in a dried state these bacilli will retain vitality for a period of months and years under favorable conditions.

The sputum of every person suffering from pulmonary consumption, contains these bacilli in large numbers, estimated by one observer to reach the number of 72 millions daily. When we recall the fact that the consumptive walks and expectorates upon our streets, visits our churches, opera houses and public halls, rides upon our railway and street cars and daily expectorates millions of these germs which may be dried out and wafted by the winds to every corner of the town, does it not show that great care should be taken and that everything should be done that their power for harm should be as much restricted as possible? While it is by no means true that all who inhale the germ contract the disease, still it is undoubtedly true that many do contract and die of the disease by inhaling the germ, who would not otherwise do so.

That the germs are widely scattered is shown by the fact that a few years ago Dr. James E. Reeves found them in the dust scraped up from the sidewalk near the postoffice in the city of Wheeling, W. Va. The same thing may be true of most of our cities. Dr. Baker, Secretary of our State Board of Health, in a paper read before the American Medical Association, says: "These bacilli are present in the sputum of consumptives and although outside of the body at ordinary temperatures, they do not multiply by reproduction, they are not destroyed by drying, and consequently in apartments occupied by consumptives who do not take care to so dispose of the sputa that they shall not become a part of the dust of the room the dust may contain these bacilli which are believed to be the specific cause of the disease."

Now what shall we do in order that the fearful death roll from this disease may be lessened? First of all it is of prime importance that we destroy all matter which may contain the tubercular germs before it dries and becomes dangerous. This should be thoroughly done. The sputum and the discharges from the patient should be well disinfected.

A good disinfectant may be prepared by adding to each ounce of water one grain of the chloride of mercury. Enough of this solution should be placed in all receptacles in which the discharges are received. A quantity should also be placed in all the spittoons in the hotels and public places.

The consumptive should never spit upon the floor of his own home or the floor of any hotel, theatre, railroad depot, school house, church or any other public place. He should use either spit cups with some of the solution above referred to or use waxed paper or cloths which may be burned before the sputum becomes dried. These precautions the patient should observe, not only for the good of those around him; but for his own good as well, as by so doing he may do much to prevent reinfection of himself.

No one should sleep with a consumptive; and those who live in the same house with a consumptive should take pains to get sufficient exercise in the open air.

As seen from the words quoted from Dr. Baker above—after a death from consumption the rooms should be disinfected as for any of the other contagious diseases.

What can we do for the young now coming up, to prevent them from contracting the disease or overcome the tendency to it? In the light of modern research hereditary transmission is not as great a factor in the production of the disease as it used to be. It is the tendency to the disease rather than the disease itself which is inherited more often. Those with a predisposition to the disease should be much in the open air, should eat healthy food and avoid all exposure to cold and damp. They should live in well ventilated houses, breathing only pure air, and use every means to increase the vitality of the body, such as good food, regular hours and abstinence from all excesses. A slight cold should receive immediate attention and nothing allowed to impair the quality of the lung tissue. A child born of tuberculous parents should be particularly cared for. The mother should not nurse such a child. The baby should either be fed upon cow's milk or some suitably prepared food, or a healthy wet nurse should be secured. Many cases of tuberculosis in children are probably due to infection from the milk of a tuberculous mother. The baby should be as much as possible in the open air and sunshine. Give the baby plenty of sleep—sleep is emphatically "tired nature's sweet restorer" and is the period of greatest recuperative power. During youth the child should be carefully watched and should still be much in the open air. Avoid crowding too much in schools and too close application to books of all kinds. Better have little education and live longer than be a college graduate and fill an early grave. Carefully watch any tendency to coughs, catarrh, etc., for it is in just these cases that the germ finds a soil favorable to its development. By careful attention to these details we may hope to do something towards limiting this great destroyer.

Dr. Henry B. Baker, Secretary of the State Board of Health, then led the discussion of the subject, somewhat as follows:—

THE RESTRICTION AND PREVENTION OF TUBERCULOSIS.

BY HENRY B. BAKER, A. M., M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICHIGAN.

The Educational Work of the State Board of Health.

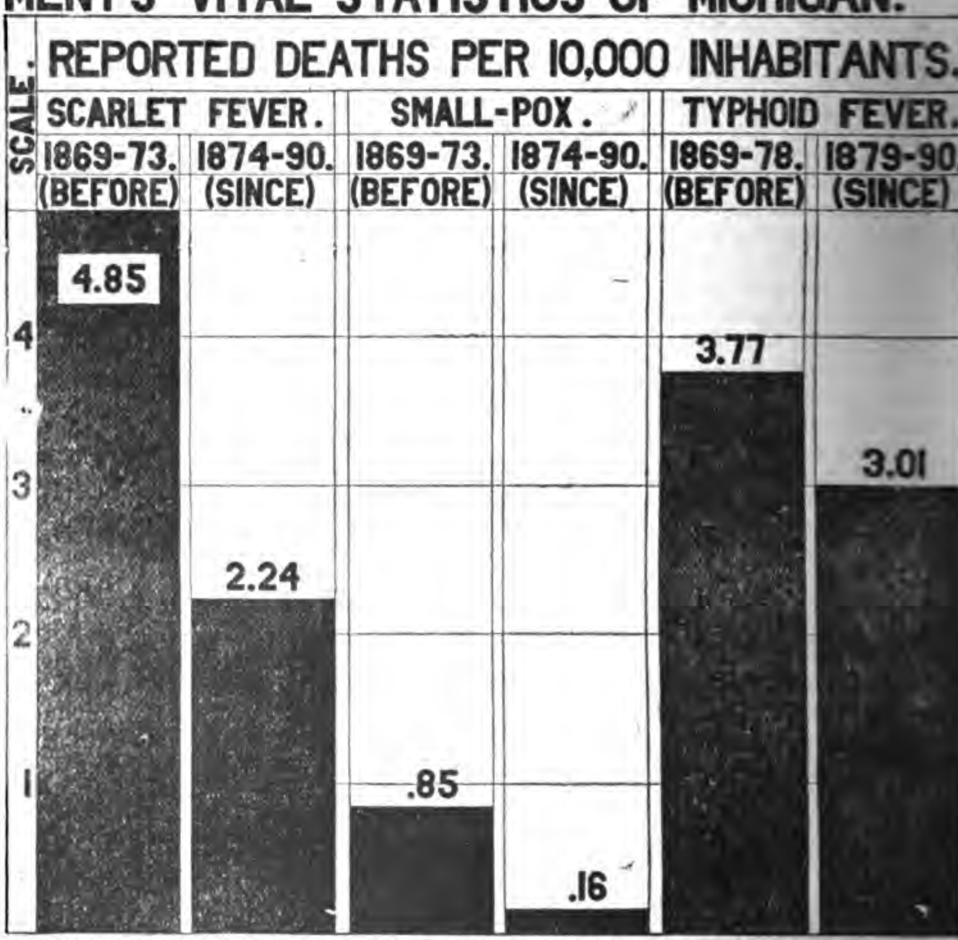
MR. PRESIDENT AND MEMBERS OF THE CONVENTION:—For the restriction and prevention of disease and death, the State has made permanent provision, delegating powers and duties to a State Board of Health, and still greater powers to local boards of health. One main function of the State Board of Health has been its educational work among the common people. Its methods of work have been devised and perfected here in Michigan; and much of its success depends upon the efficient coöperation of local health officers. Although well known to many, the educational system may well be briefly outlined here, because the restriction and prevention of tuberculosis calls for the adaptation of the educational methods of the State Board of Health to the work of educating the people of Michigan on the subject of tuberculosis. A fundamental principle in this system of education is, that the facts, which will enable people to restrict and prevent a given disease, are placed before the people at a time when they are most likely to be interested in the subject, namely, when that particular disease is in the same or some neighboring household, and is, therefore, threatening the members of their own household. The State Board of Health sends its pamphlets or leaflets of instructions to the local health officer, and asks that he distribute the instructions to the neighbors and in the case of consumption to the inmates of the house in which the dangerous communicable disease is.*

This system has been in operation in Michigan for twenty years, and its results are known, not only for one disease, but for several diseases. It is not an untried experiment, it is a well-demonstrated means of restriction and prevention of communicable diseases. The mortality statistics collected by the Secretary of State, and the statistics collected by the State Board of Health agree in proving this. Thus the State-Department Statistics show that since this system of education has been in operation, the mortality from scarlet fever in Michigan has been less than half what it was before. The statistics of the State Board of Health show that in those localities in which its methods of isolation and disinfection have been wholly enforced, the mortality from scarlet fever is not more than one-fifth what it was in those localities in which these measures have been neglected. So that, while throughout the entire State one-half the mortality from scarlet fever has disappeared, there is opportunity for a continuance of the work until at least four-fifths of it has disappeared. I have distributed here diagrams which illustrate this portion of this paper. [Printed on pages 84 and 85.]

* Copies of the leaflet [175] and of the slip relative to the prevention of Consumption, issued by the State Board of Health, were distributed in the audience.

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

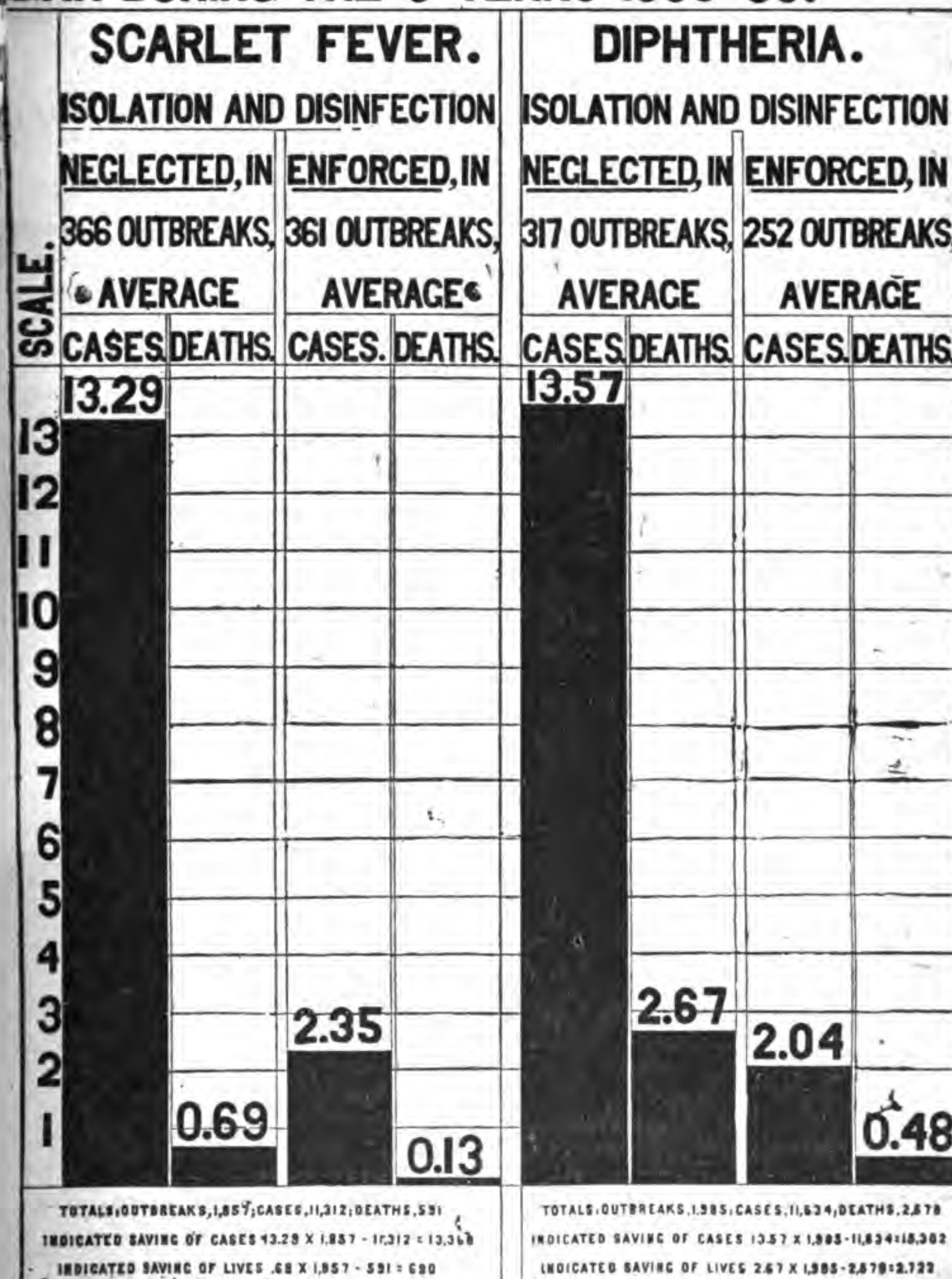
LIVES SAVED BY PUBLIC-HEALTH WORK. COMPARISON OF DEATH-RATES IN MICHIGAN FROM SCARLET FEVER AND SMALL-POX BEFORE AND SINCE THE STATE BOARD OF HEALTH WAS ESTABLISHED AND FROM TYPHOID FEVER BEFORE AND SINCE ITS RESTRICTION WAS UNDERTAKEN BY THE STATE BOARD. COMPILED FROM STATE DEPARTMENT'S "VITAL STATISTICS" OF MICHIGAN.



LIVES SAVED FROM SCARLET FEVER (17 YEARS) 7,266; SMALL-POX (17 YEARS) 1,821; TYPHOID FEVER (12 YEARS) 1,671.

MICHIGAN STATE BOARD OF HEALTH EXHIBIT.

ISOLATION AND DISINFECTION RESTRICTED SCARLET FEVER AND DIPHTHERIA IN MICHIGAN DURING THE 5 YEARS 1886-90.



Throughout the State as a whole, the mortality from small-pox is now not more than one-fifth what it was before the inauguration of the work of local education.

Throughout the State as a whole the mortality from typhoid fever is less, by a considerable amount, than it was before the educational methods had been applied for the restriction of that disease.

It has been proposed now to enter more vigorously upon the educational work for the restriction of the most important of all diseases,—pulmonary consumption.

The State Board of Health believes that consumption is a dangerous communcable disease. Accordingly it has so declared by resolution.* One main purpose of the resolution is to secure information of the location of every well-developed case, in order that the system of local education which has been so successful in the restriction of other diseases, may be applied to the restriction of consumption. If householders and physicians report all cases of well-developed consumption to the local health officers, and the local health officers report them to the State Board, there will soon be a mass of valuable information, as to the number of persons sick with that disease, their distribution about the State, something as to their condition and surroundings, and data, will have been collected which in years to come will be useful with which to compare the results of the line of action pursued. But the first main purpose of the reports is to enable the State Board of Health to carry out a "campaign of education" which shall include all consumptives sufficiently intelligent to read and reason from cause to effect, and all such persons most liable to be endangered by the infectious specific cause of tuberculosis.

In this movement for the notification of tuberculosis, the State Board of Health asks the coöperation of the medical profession throughout the State. The Board especially expects the coöperation of all health officers.

After the notification and the record of each case have been made, and the education of the patient and persons endangered has been attended to, just what further shall be done will remain to be decided in each case. The State law (act 137, laws of 1883) which requires every case of "disease dangerous to the public health" to be isolated, the premises placarded, and other notice given by the health officer if necessary, is not required by the law to be enforced if the local board of health instructs its health officer "to do otherwise." My suggestion is that in every case of small-pox, scarlet fever and diphtheria, the local board of health should instruct the health officer to strictly enforce all the rules in that law, but to use his own best judgment in each case of consumption.

If the local board of health takes no action, the law (act 137, laws of 1883) requires the health officer "To order the prompt and thorough isolation of those sick or infected with such disease, so long as there is danger of their communicating the disease to other persons." If the tuberculous patient takes such care of the sputa or other infectious material that there is no "Danger of communicating the disease" to another person, then the health officer need not "order the prompt and thorough isolation" of such a tuberculous person. But in every case in which there is danger of spreading the disease, the law is plain, and it requires isolation.

---

* Resolution adopted by the Michigan State Board of Health, September 30, 1893:

"*Resolved*, That hereafter, consumption (and other diseases due to the *Bacillus tuberculosis*) shall be included in the official list of 'Diseases dangerous to the public health,' referred to in sections 1675 and 1676 Howell's statutes, requiring notice by householders and physicians to the local health officer, as soon as such a disease is recognized."

A Plea for a State Hospital for Consumptives.

Isolation is a powerful factor for the restriction and prevention of all communicable diseases. A few centuries ago leprosy was common throughout all England. Isolation leper-hospitals were made to dot the map of that country from one end to the other, and *leprosy disappeared.* Leprosy is a more *chronic* disease than tuberculosis. Yet isolation hospitals stamped it out of England. Isolation was a hardship to hundreds, but the disappearance of leprosy was a grand result to the thousands who have since enjoyed immunity. The same principle applies to tuberculosis. All sanitarians are agreed that among the most powerful means for the restriction and prevention of the communicable diseases are isolation hospitals. This is especially so because of the impossibility of preventing the spread of disease in the homes of the poor. The rich and intelligent can frequently prevent the spread of disease *from* their own spacious homes, but they cannot prevent disease from coming *to* those homes from the crowded homes of the poor, who serve the rich, as laundry women, carriage drivers, and in various ways, and who also spread disease to rich and poor, intelligent and ignorant alike, by scattering sputa in public halls and other public places. The State Board of Health has recommended a State hospital for consumptives, and will memorialize the legislature for the establishment of such a hospital. Already there has been application for entrance to such a hospital. That consumptives would gladly fill such a hospital, there can be no reasonable doubt.

There is now a large class of consumptives who are scattering the seeds of death broadcast over this State, infecting the food and air of dairy cattle which supply milk to children throughout the State, and of the animals whose flesh is used for food; infecting homes and public places, so that *more than three thousand persons contract tuberculosis in Michigan in every year;* many of that class of consumptives are not likely to be successfully taught how to manage so as to avoid spreading the disease, except through such training as can be given them in a special institution carefully managed by an expert medical sanitarian. In such an institution many of them could be successfully taught; and, from being centers for wide-spread infection, they could be converted into comparatively safe citizens. Is there any State institution which does as much good as a hospital for consumptives promises to do?

I dwell upon the utility of a State Hospital for consumptives not for its benefits to a class of unfortunate citizens worthy of sympathy, and of all possible aid to recovery, but especially as a means toward the restriction of tuberculosis. *In that restriction the State has an immense interest.* Three thousand new cases each year, three thousand deaths, and six thousand persons constantly sick with consumption, in Michigan, implies, I think, a loss of more than three millions of dollars per year,* and an amount of human suffering which, when we think of it as unnecessary, is simply appalling.

*Estimating that, if life had not been cut short, the future earnings (for those dependent on them) in excess of the cost of maintenance, of each of the 3,000 who died, would have been only $500, the sum lost is	$1,500,000
Loss of wages of 6,000 sick (using up subsistence) each $200 per year	1,200,000
If one-sixth of the 6,000 require a nurse, the wages of one thousand at $250 per year each is	250,000
Six thousand sick would require doctors and medicines, say $20 each	120,000
A total of	$3,070,000

Compared with ordinary life-saving measures, the restriction of the dangerous communicable diseases is of overshadowing importance. The United States Government has a Life-Saving Service, with its employés on every coast; and its savings of life and treasure are worthy of every such effort. Yet in the aggregate throughout the United States these savings of life and treasure are small compared with what has been demonstrated to be practicable in a single State like Michigan through the restriction of diseases. Thousands of human lives have been saved from small-pox, diphtheria and scarlet fever. It is proposed now to apply some of the same methods, which have been so successful in these diseases, to the restriction of that disease which now causes the most deaths.

The State of Michigan, by its Board of Health, asks the coöperation of the medical profession of this State, the local health officers throughout Michigan, and the people generally, in every effort which promises to reduce this continual drain upon the life, health, happiness and productive energy of the people of Michigan, through this communicable and as the Board believe preventable disease; and, with such coöperation, I fully expect that this grand work—the restriction of tuberculosis—will eventually be accomplished.

The stupendous import of this can now hardly be appreciated,—it means the saving to the people of this State, in every year, of millions of dollars in money values, the saving of thousands of human lives, and that thousands of our people who without restriction of tuberculosis would suffer anxious years of sickness, will hereafter live healthy, happy lives. I sincerely believe that, through the earnest efforts of the State and local boards of health, the coöperation of our people, and wise legislation, we may confidently look forward to such a "good time coming."

THE DISPOSAL OF WASTE AND EXCRETA IN UNION CITY.

BY DR. S. B. FRANKHAUSER, UNION CITY.

I feel like underscoring the last two words of the subject as given here as in one respect it seems to limit and in another to broaden the ground upon which to talk.

We are interested in the country at large, the cities and villages, but it is quite natural that we should be *more* interested in our immediate home, and the habitation of our people, and to *their* welfare we are looking and spending our swiftly passing moments. *Any* question that pertains to the *public* welfare, pertains to *private* welfare; *individuals* can not prosper without the *public* prosper; and individuals can not prosper in any way without health. The physician is looked to for protection against the causes of disease, and properly so. It is not to be expected that the laity should be posted on subjects, for the development of which, men are spending their life work. It is necessary that men should divide this great and wide subject, and some strive for the development of *one* branch, while others devote their time to other subjects. The practicing physician can not be an expert chemist and spend the necessary hours in chemical laboratories; neither can he be an expert bacteriologist and spend the hours required in cultivating the different new discoveries of germs and prove them by the four rules of Koch, to be the causes of certain distinct

diseases. *But*, the different workers can help each other and keep the practicing physician posted through the Medical Journals, etc. The doctor is expected, and certainly should be able, to give advice to those around in regard to hygiene of their surroundings. The great and wise Creator has provided means by which the waste and excreta can be disposed of and in this way assist nature to fight against the destroying power of disease. We have not been placed carelessly in the midst of enemies and friends of our bodily destruction without means of defense. The body is prepared with weapons and ammunition for its protection. But the standing force occasionally becomes overworked, they have been on duty too long without being properly cared for and the enemy finds a "place of least resistance." *Therefore* we want to take all the necessary precautions that our advancing scientists have taught us; we must prepare for war in times and conditions of warfare.

This is no longer the time of peace, that golden opportunity has long passed by since the settlement of Union City; the opposing forces have advanced; the order has been—*to fire*. The enemy has invaded our camp numberless times and today stands bold and fearless in our midst.

Union City has had no trench works, no barrier to climb; the road has been clear and I believe that the natural gift God has given this city in the way of drainage has for many years been wasted. We could not ask for a better outlet to a system of sewerage than we have—the union of two beautiful rivers—not so large but large enough. The disposal of waste and excreta means a great deal. It means the waste of the body. It means the manure in the stables. Proper care of all this would necessitate first *cleanliness* of the body. I believe people can become so accustomed to filth that they do not notice it. I do not imagine that all the families whose kitchens (and the whole house) smell filthy, realize it at all. They have hoveled in it so many years, the children were born in it and the sense of smell has become so accustomed to it that they are more apt to think a clean house that has no offensive odor is not right than they are to notice their own filth.

I tell you today doctors and people that have met here in this convention, it can not all be done either through sewerage or by means of scavengers. One problem to solve is to get the waste into the sewerage stream. I have heard people say they were wanting for bread, clothing, and shelter, and they beg for these; but I never heard of persons in need begging for soap.

It is not only the spot where garbage is dumped, and the vaults and the barn yard, but very often it is right in the kitchen, and the woodhouse that better sanitary conditions are needed. *If these* places are not looked after it would do only a part of the good needed to take care of the more prominent places which, of course, I admit is the most necessary. But the point I wish to make is that without a cent of expense either to the individual or the public, the child's clothing could be *washed* and *changed*, the slop and dirt that fills the cracks of some kitchen floors, and the rotting chips and dirt of the wood-house could be cleaned out and taken to the spot where the scavenger (whom I am going to recommend) could get it.

Now I wish you all to bear in mind that as my subject is stated, I am only to speak of disposal of waste and excreta in Union City and must therefore modify a part of my statements. I do not believe there is a

town or city on the globe that has a better set of housekeepers and cleaner kitchens and woodhouses than Union City, and if it were not for them what would it be?

We have no sewerage, and the probability is we will not have such a system, but if we could, I would most emphatically recommend the construction of a sewer. With the natural facilities of our place the expense would not be great, and if this, like the question of water-works, could only be agitated and brought about in some way, there would not be one person that would set a price on it with the object of having it removed.

But the waste of Union City *can* be disposed of without a sewer and in a way satisfactory to the health of the people.

Heat is usually named first among the disinfectants and a great many scraps from the table and kitchen can be burned; accumulations of decaying vegetables, etc., should be prevented by disposing of them at a regular time; manure should be drawn away as fast as it accumulates, as often as once a week or better yet, every third or fourth day.

These regulations should be *made* and *enforced.*

Vaults and cesspools have no place when it comes to recommending proper means by which excreta shall be disposed of according to the sanitary views of today. There is no doubt but we can trace the origin of distinct cases to the vaults and cesspools. I think that the dry earth closet with a water-lime cement bottom should be disinfected every day and the contents drawn away to be put on some field or garden with the other refuse.

The closets that are in use now could be cleaned out, filled up and converted into a dry earth closet and the end, namely—to disinfect and regularly remove contents would be reached.

Let the scavenger be appointed by the board of health, let him be paid and be held responsible; and a regular time set for him to make his trips to each vault in this place.

Every house should be supplied with a recepticle in the back yard for the deposit of garbage. This should be a lined box, tight cover, some disinfectant used every day, the contents drawn off by the scavengers and disposed of to gardeners who would be willing to pay for the fertilizing agent.

I believe if this could be carried out, and it *could*, we would need have little fear of diphtheria, typhoid fever and kindred diseases.

"Cleanliness is next to Godliness," next to perfect health, and it is necessary for us to help ourselves to use the means provided by nature to get rid of filth and dirt.

We need not live in an atmosphere of germs and disease if we only stir up and do what we know is necessary to live in good hygienic surroundings.

(Reporter's Abstract.)

Hon. Frank Wells, President of the State Board of Health, Lansing:—This subject of the disposal of waste and excreta is an extremely important one to every city and village in our land. Upon the proper solution of it depends largely the health and lives of the citizens of every community.

While Mr. Frankhauser's paper has expressed largely my thoughts, and its discussion has fully covered nearly every point of value, I wish to add a few words.

In going about your city I find a great many sore spots. Ancient cesspools and other receptacles of filth are met with everywhere. These should not exist in a town possessing the natural advantages of Union City for drainage.

You are about to put in a public water-supply. More than half the value of this improvement will be lost without a system of sewerage. In the absence of such a system the sore spots I have mentioned, in which the germs of disease are stored, will continue to multiply and be a constant menace to the lives of your citizens. You have wealth in this beautiful little city and cannot therefore plead poverty as a reason for depriving yourselves of this needed improvement. In the interests of health, decency and comfort, let a system of sewerage be coincident with your public water-supply.

Lawyer Stiles of Union City made a few remarks and thanked those from abroad who had contributed papers, etc., and expressed his belief that, with the "eye openers" the people of Union City had received, there would be less sickness and fewer deaths.

Hon. Frank Wells responded to the remarks, in behalf of the State Board of Health, in a very pleasing manner.

The following resolutions were presented by Mr. Robinson, and adopted by the Convention:

Resolved, That this Convention, by its officers, respectfully memorialize the next legislature for an appropriation sufficient for the purpose of building, equipping and maintaining a State Hospital for Consumptives.

Resolved, That the planning, construction and equipping of the State Hospital for Consumptives may well be entrusted to the State Board of Health and the future management to the Regents of the State University.

Resolved, That the location of the Hospital should be such that it may be accessible by railroad to the thickly-settled parts of the State, and such as to permit of out-door exercise and light out-door labor whenever the weather will permit.

Resolved, That it is the judgment of this Convention that the proposed State Hospital for Consumptives should be located at the seat of the State University at Ann Arbor, in order that it may afford the best opportunities for the observation and study

of this most important disease, in conjunction with the investigations now being so satisfactorily pursued in bacteriology and other departments of sanitary science at the State Laboratory of Hygiene.

Resolved, That this Convention hereby respectfully memorializes the Legislature of Michigan, at its next session, to take such action as will result in a knowledge of the extent to which the dairy cattle and other animals supplying meat or other food products to the people of Michigan are infected with tuberculosis. Also that it take such action as will tend to stop the spreading of tuberculosis among animals, and from animals to man.

On motion the Convention adjourned.

PROCEEDINGS AND ADDRESSES

AT A

SANITARY CONVENTION

HELD AT

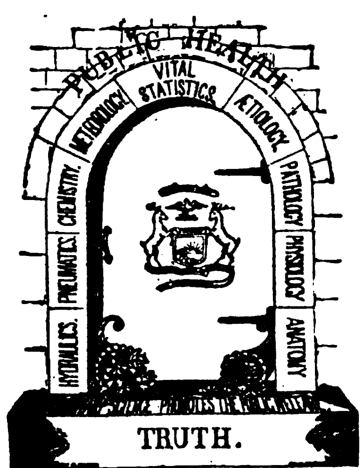
CHARLOTTE, MICHIGAN,

NOVEMBER 22 AND 23, 1894.

UNDER THE DIRECTION OF A COMMITTEE OF THE STATE BOARD OF HEALTH AND A COMMITTEE OF CITIZENS OF CHARLOTTE.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH FOR THE YEAR 1895.]

[No. 428.]



MICHIGAN STATE BOARD OF HEALTH SEAL.

BY AUTHORITY.

LANSING:
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS.
1895.

PROCEEDINGS

OF THE

SANITARY CONVENTION

HELD AT

CHARLOTTE, NOVEMBER 22 AND 23, 1894.

[SUPPLEMENT TO THE REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR THE YEAR 1895.]

[No. 428.]

Robert Smith & Co., State Printers and Binders, Lansing.

RESOLUTION OF THE STATE BOARD OF HEALTH RELATIVE TO PAPERS PUBLISHED IN ITS ANNUAL REPORT.

Resolved, That no papers shall be published in the Annual Report of this Board except such as are ordered or approved for purposes of such publication by a majority of the members of the Board; and that any such paper shall be published over the signature of the writer, who shall be entitled to the credit of its production, as well as responsible for the statements of facts and opinions expressed therein.

CHARLOTTE SANITARY CONVENTION.

CONTENTS.

PROCEEDINGS,

ADDRESSES AND DISCUSSIONS AT THE SANITARY CONVENTION HELD AT CHARLOTTE, MICH., NOVEMBER 22 AND 23, 1894.

SUPPLEMENT TO REPORT OF THE MICHIGAN STATE BOARD OF HEALTH, FOR 1895.

This Convention was held under the auspices of the State Board of Health, arrangements having been made by a local committee of citizens of Charlotte, acting with a committee of the State Board of Health.

The following named persons constituted the various committees:

Committee from the State Board of Health.—Prof. Delos Fall, M. S., Albion.

Local Committee.—Mayor Frank Merritt, President; Dr. Patterson, Secretary; Judge J. L. McPeek, Rev. W. F. Dickerman, Dr. Mary Green, Mrs. J. J. Curtis, G. A. Perry, L. P. Bissell.

Music Committee.—H. S. Maynard.

Reception Committee.—Dr. G. B. Allen, Dr. W. H. Rand, Dr. A. R. Stealy, Rev. H. S. Roblee, Rev. W. F. Dickerman, Mrs. Dr. M. S. Phillips, Mrs. Addie Morey, Mrs. S. T. Green, Mrs. Belle M. Perry.

Executive Committee.—Hon. Frank Merritt, M. D., Henry B. Baker, M. D., and P. D. Patterson, M. D.

President.—Frank Merritt, M. D., Mayor of the City.

Vice Presidents.—Dr. J. D. Bradley, Eaton Rapids; Judge Clement Smith, Hastings; Dr. G. B. Allen, Charlotte; Dr. Wm. Parmeter, Vermontville; Dr. C. S. Sackett, Brookfield; Miss Cynthia E. Green, Charlotte; Dr. Mary E. Green, Charlotte; Hon. Hiram M. Allen, Bellevue; F. L. Snell, Kalamo; Dr. Tyler Hull, Dimondale; Prof. Hamilton King, Olivet; George N. Potter, Potterville; Superintendent, O. L. Miller, Charlotte; Dr. Sarah J. Allen, Charlotte; Superintendent, J. L. Wagner, Grand Ledge; J. M. C. Smith, Esq., Charlotte; W. H. Sutherland, Oneida; Hon. George Huggett, Charlotte; Mrs. Horton Bryan, Charlotte; and H. S. Maynard, Esq., Charlotte.

Secretary.—P. D. Patterson, M. D., Charlotte.

Stenographer.—Miss Ada O'Neil.

FIRST SESSION.—THURSDAY, NOV. 22, AT 2.00 P. M.

PRAYER.

BY REV. MR. LEWIS, CHARLOTTE:

[Reporter's Abstract.]

Let us pray—Our heavenly Father, we thank Thee that in Thy good providence we can gather for such a convention as this this afternoon. And we praise Thee that we may ask Thy blessing upon us as we do in all the affairs of life.

We do thank Thee Father, that we have the aptitude to find out the relations of things here, and we thank Thee for those who investigate the laws of our being, and those things that have to do with life and so much of its happiness. We thank Thee that so many give their attention to these things. And we ask Thee for Thy divine blessing upon them. We ask Thee to grant that they may be enabled more and more through Thy blessing, to bring to pass things that may elevate humanity. And we ask Thee Father, to grant that in all we do, in all we think, and in all we investigate that we may still acknowledge Thee the giver of life, and glorify Thee in everything through Jesus Christ, our Redeemer. Amen.

After the prayer by Rev. Mr. Lewis, there was music—"Light of the World." Following the music, the Mayor of Charlotte gave the following Address of Welcome.

ADDRESS OF WELCOME.

BY HON. FRANK MERRIT, M. D., MAYOR OF CHARLOTTE.

To the Officers and Members of the State Board of Health, Ladies and Gentlemen:—

The city council not long since unanimously resolved to extend to you an invitation to hold a sanitary convention in this city, in the near future. That resolution was met with the hearty approval of our citizens, and in their behalf I now take great pleasure in bidding you welcome.

Although our city has always been noted for its hospitality in entertaining the people at conventions and assemblies, yet this is the first time in its history that we have had the honor of welcoming among us, gentlemen assembled to discuss the causes and prevention of diseases to which flesh is heir, and that our people may be made better acquainted with this important branch of science.

We realize that sanitation is a branch of science that has taken years of study and earnest pursuit on your part, to now be able to go out among the people and sow broadcast the seeds of knowledge gathered by you while laboring for the benefit of mankind.

Every person in this city, it matters not what his or her calling in life may be, should, and I am sure will, do all in his power to make this, our first sanitary convention, a grand success.

Every physician is supposed to have a thorough knowledge as to the causes which tend to germinate and the precautions necessary for the prevention of various forms of diseases and is looked upon by the people as their counselor upon subjects pertaining to sanitation. Therefore we do not consider this to be a convention of Doctors, but one in which the clergyman, lawyer, business man and all are justly interested.

I undoubtedly voice the sentiments of every citizen in this city, in saying that there is no convention that could be held here, from which the knowledge thus gained could be applied to a more useful end, than the one here assembled, for, by listening to the able papers announced upon the program, and discussions which are to follow, we may at its close, feel, that we are better fitted, not only to battle more successfully with the causes of disease, but better prepared to preserve the health of our own families, as well as those about us.

And now in conclusion, to those who are announced upon the program as co-workers with the State Board of Health and to whom we look as educators in the science of sanitation, as well as those from abroad who have seen fit to honor us with their presence, we extend to you a cordial welcome, and hope that in future years, we may look back to this the 42d sanitary convention, as having been one both profitable and instructive.

Again I bid you a hearty welcome.

RESPONSE, AND STATEMENT OF THE OBJECTS OF THE CONVENTION.

BY HON. FRANK WELLS, PRESIDENT STATE BOARD OF HEALTH, LANSING.

[Reporter's Abstract.]

I assure you that the State Board of Health, and I have no doubt I speak the feelings of other gentlemen and ladies who are present at this Convention from abroad, appreciate most heartily the words of welcome we have just listened to from your Mayor. We thank him for these words, and we thank the citizens whom he represents for their kindly greetings and for the interest in this convention which their large attendance at this its first meeting implies.

The object of a Sanitary Convention is to disseminate knowledge among the people. Knowledge, loses a large portion of its value if confined to those who have by investigation and original research secured it. The teacher in your school, or the professor in your college may perhaps have a vast amount of very valuable knowledge, but it is largely useful as he succeeds in impressing such knowledge upon his pupils. In the Middle Ages most of the knowledge that was of value was in sole possession of the churchmen or priests. The masses possessed but very little, and it was only as knowledge finally in the course of time permeated down through these masses that mankind reached its present high plane of intelligence. It is for the purpose of spreading abroad among the people of your city whatever knowledge of value your own citizens, and those who visit you on this occasion, may have acquired that will be of use to you in the preservation of your health and lives that this convention is held.

Of all knowledge that the human mind can acquire none can be of more value than that which relates to the causes of disease and the means for its prevention. Without health neither honor, wealth, nor anything that

we can acquire in this world seems of any real value. With health, the poorest peasant in our land, the hardest laborer on our streets, may be happy. It is therefore important that we all be put in possession of that vast fund of knowledge that has rewarded the researches of investigators in the domain of Sanitary Science during the last score of years. Nearly everything in this domain is recent knowledge. Previous to the time I speak of there was no such thing as real Sanitary Science. People recognized the fact that there were unsanitary conditions; that those who lived amid filth and foul surroundings, suffered from disease. But why this was so, none could satisfactorily explain. At the present time we know that all those diseases that we regard as contagious like diphtheria, small-pox, scarlet fever and many other are caused by living organisms that in some way obtain access to the body. This access to the body by these organisms is gained in four ways: by direct personal contact, by the air we breathe, by the food we consume, and by the water we drink. Knowledge of these foes of life and health, their work, methods and how they may be destroyed or avoided constitutes the sanitary science of today.

It is for the purpose of teaching you this science so far as we are able and how to free your lives from these organisms of disease, that we meet you today. Local conditions in their relation to these causes of disease will be considered by those most familiar with them, your own citizens. Your water supply, the necessity for sewerage, the ventilation of your public buildings, school hygiene and other local subjects, I observe from the program are all properly to be treated by residents of this city. Another matter which will be considered by them is the character and condition of your health service, as shown by the accomplishments of the officers to whom you have given the most important work that can possibly be given to any officials by the people. Your board of health, your health officer, what are they doing? What is he doing? are important subjects for you to consider. The importance of having a good health officer in a city like this can scarcely be over-estimated. I hope that in this respect you are fortunate. In many places they are unfortunate. I trust that it will not be considered inappropriate if I say a few words concerning the State Board of Health and of some of the objects it hopes to promote through these conventions aside from the local benefits they expect to produce by them. A time arrived in the history of our State when it became important that there should be some authority created where local health officers could report communicable diseases to the end that steps might be taken to prevent their spread to other localities. For this reason a State Board of Health was created. That State Board of Health began its existence in 1873. Today it has reached the twenty-first year of its life, and it has signalized the advent of this year of its majority by initiating one of the most important works it has ever undertaken. It has placed among those diseases that it regards as dangerous to the public health, tuberculosis or consumption. This disease is said to cause one-seventh of all the deaths of human beings in the world. It is a disease, as will be pointed out to you, that is caused like all other communicable diseases of which I have spoken by an organism which enters the human body and there does its work. The Michigan State Board of Health is the first State Board that has taken this very important step. Local health officers are now required to report every case of consumption to the State Board of Health. Upon receipt of such report the Board sends

literature concerning this disease to the person who is suffering, to his family, and to his neighbor. This literature states the cause of the disease, and how it spreads. It shows that sputa from the lungs of the person suffering from consumption is taken up by the atmosphere; it flies like the down of the thistle, is carried hither and thither by the wind, and if inhaled by any one may again begin its work of destruction.

Though the life processes of the body are usually sufficient to prevent this destructive work after gaining admission, yet an inflamed condition of the lung tissue caused by a cold may give it the opportunity to furnish another victim to this dread disease. I say that the State Board of Health has this year signalized the fact that they have reached the age of manhood by this important action. We trust and we hope that through this action the time is not far distant when people generally will be so educated, and so alive to the contagious character of this disease that they will demand such laws from our legislature and action from our officers as will prevent those suffering from consumption from being a menace to the health and lives of the community. Then this disease, like many other of the fatal diseases that have caused wide-spread havoc in the past, will be known only in history. It is possible that within a comparatively few years this will occur. Many of you here today have suffered in your homes from this disease; and I believe there is sympathy in the hearts of all such for every effort that can be made to secure immunity from this disease which every year fills three thousand untimely graves in Michigan. To accomplish this we have already invoked the aid of health officers, and shall also seek legislation. We hope to secure legislation that will result in the building of a hospital, that those who are suffering from this disease may come from, factories and shops where they are a menace to their friends and the community, and be placed where they not only will have the best care possible but in other ways be under the most favorable conditions for recovery.

This work of the Michigan State Board of Health is one in which you should all feel an interest, and one in which you may each lend some aid. The community needs your help in this as well as in purely local sanitary work. Do not say "The doctors will take care of all that." The doctors are interested not in preventing sickness, but in taking care of the sick after disease has gained a foot-hold. I want to say this, however, that it is a great credit for physicions that they do so much in the way of preventing disease. I say that it is greatly to their credit because every step in prevention is taking money from their pockets. Yet it is true that in general wherever we hold sanitary conventions we find the physicians are most active workers, as well as the clergymen, and the lawyers.

I am glad to see that so many subjects are to be treated in this convention, but there is one to which I wish to call special attention. I suppose you are all aware that at the present time, and during the coming winter, we are menaced by two very dangerous diseases—small-pox and diphtheria. The seeds of these diseases have been freely spread throughout Michigan. Small-pox is readily controlled by vaccination; and, if this city of Charlotte has not already taken steps to have its people vaccinated and re-vaccinated, I want to urge them to do so. We have much diphtheria also in our State. This like small-pox is a cold-weather disease, and the efforts of our best medical experts and health officers should be invoked to stamp out promptly this disease.

I am very glad indeed to see so large a number of people at this first session of the convention. It certainly does show unusual intelligence on the part of your community that at the first meeting of a sanitary convention so many are in attendance. We sincerely hope that the gain to you will be great, and that something may be done at this convention to hasten the advent of that ideal time when men will not be cut down in the bud and flower of their existence, but will live on and be garnered only in their ripened years as we believe God and nature intended.

ADDRESS BY THE PRESIDENT OF THE CONVENTION.

BY HON. FRANK MERRITT, M. D., MAYOR OF THE CITY.

Members of the State Board of Health, Ladies and Gentlemen:—

In the year 1873, there were appointed by the Governor six gentlemen who, with a seventh chosen by the six were to be known as the State Board of Health, giving them the general supervision over the sanitary laws of the State, as well as general supervision over the local boards of health in the different towns and cities. Since that time, each and every member of this board has, by strict application to the duties intrusted to him, and by the aid of the State in a financial way, sending into almost every home pamphlets treating upon vital questions relative to public health, and by instructing local boards of health in their duties and powers as such officers, been able to make great progress in this the most important branch of science. As a result they are now able to successfully grapple with the causes, and to prevent many of the most dreaded diseases.

It is a well-demonstrated fact that as modern science teaches us, disease is not a thing, but a state or condition; in other words a suffering body is simply the penalty of violated law; and it follows as necessarily as an effect follows a cause; therefore, while this be true, a proper knowledge and observance of the sanitary laws laid down by our State Board of Health, would greatly lessen the number of diseases which not only rank among those of a contagious nature but many others of no less importance.

In all countries where the people have become civilized and enlightened, laws are made for the purpose of removing any and all causes which tend to produce conditions whereby the health of the people is endangered. And it should be the aim of every local board of health to use every means for the enlightenment of the people of their city, village or township, and to educate them up to that standard where each household will have for its board of health the members of its own immediate family.

There are many countries where almost every reform is brought about by the strong arm of law, but we, in this free and independent America, must be guided more or less by the will of the people, therefore our efforts should be towards the education of the masses, and to cause them to understand that if they would prolong their lives, and preserve the health of their children, certain conditions must exist, and the laws of sanitation must be observed.

No science has grown so rapidly within the past twenty years, as has that of sanitation; and by constantly distilling into the minds of the people the necessity of strict observance of its laws, great good has been accomplished, and I know of no better way by which the people can be

made to realize its true worth, than by the plan adopted, of holding sanitary conventions in different cities and villages throughout the State. In this connection I wish to quote from the American Medical Journal of February, 1892, a compliment paid to Michigan, which says: "Michigan with Massachusetts may justly claim a leading position in the public health movement. The people support their State board of health which carries on its work under the long-continued guidance of one who is perhaps the most eminent authority in the western world, and a notable feature in the program of this board has long been the holding of sanitary conventions from time to time in different parts of the state, small towns not being overlooked."

Vast amounts of money have been expended in penetrating the unexplored regions for the benefit of mankind; precious lives have been sacrificed in search of scientific knowledge, and while we may never understand fully the science of sanitation, yet in the great search of mankind for higher scientific thought, they have by ceaseless energy, made this science what it now is, and have placed the fruits of their labors at the very doors of each and every household in the land, so that the knowledge thus gained has become the common property of all.

We must be ever mindful of the fact that the best results in sanitation is where public sentiment will join with us in our works as health officers; and that where there are those who are indifferent to sanitary laws, and by their own willful methods are continually endangering the health and lives of others, they should be made by the strong arm of law, to heed the appeal to those high in authority, but I am proud to say that there are but few who will not at the present time, welcome any suggestions which will tend to make home happier and prolong the lives of their families. As has been well said, whatever advantage nature has accorded in the site of our own dwelling places man by his ignorance and indifference may soon destroy, therefore, it behooves one to guard well the gifts held within his grasp, and to check the tendency towards pollution, by educating the ignorant and arousing the indifferent.

Quoting from an article in the Sanitary News, which fully defines my position, it says: "A mistaken idea prevails, that an epidemic must prevail before there is need for any sanitary precautions, when the truth is, such epidemics are always evidence that these precautions have been fatally neglected. Moreover the greatest mortality does not result from epidemics, but from deaths constantly occuring in the course of such diseases as are admitted to be wholly preventable, and result most frequently from the unsanitary conditions of neglected homes, and in the absence of inspection and preventive means. Extend throughout communities, such diseases as diphtheria, scarlet fever, typhoid, and others of this class, are constantly carrying off their victims, and in the aggregate far surpass the deaths in epidemics. These diseases if they do not result directly from ill kept homes find a lodgment, and their virulence and extent is increased. To such a degree has sanitary knowledge been disseminated, and the facilities for gaining such knowledge are so ample, that it is not a utopian dream, to suppose every individual a sanitarian and every home a sanitarium.

No person claiming protection under American laws, has any right to claim the high honor of standing at the head of a household, unless he does all in his power to make that home happy and healthful, and he should not be allowed through his own indifference and willful neglect of sanitary

laws, to bring discomfort and sickness into his own home thereby inflicting a wrong upon his neighbor and a burden upon the public.

There are numerous cases recorded where disease has originated from the remotest cause; and whenever disease is thus produced as the effect of nonobservance of sanitary laws in one family, such neglect is oftimes the cause of sickness in others.

Keep clean should ever be our watch-word, not only within the home but in its surroundings, and by so doing, it not only brings sunshine and invigorates life, but invites health, happiness and wealth. Let us try to put well into practice what we already know, and in good time we shall be able to work out many of the difficult problems which now seem to us so obscure.

THE EDUCATION OF THE PEOPLE ON SANITARY SUBJECTS.

BY REV. H. S. ROBLEE, A. B., CHARLOTTE.

(Reporter's abstract.)

I feel somewhat this afternoon like the old gentleman you may have heard of. He had been a toper all his life, and one night the boys succeeded in getting hold of him and bringing him into a Good Templars' Lodge. His first remark was that he felt like a cat in a strange garret.

I have just a few things to suggest. The value of life is a subject that grows with intelligence. We turn from the survival of the fittest to the survival of the unfit. Today the age of theories and fancy is largely past; and this is one that is practical. We really don't care today for anything that is not practical. Every phase of life displays it: pulpit, press, medical profession. This thought is being emphasized. The eyes of the world are being turned to the common people. This convention was called in accordance with that idea–to help the common people.

The need of this education is marked. You have not forgotten how the people fought the health authorities in Milwaukee when these health authorities were trying to stay a small-pox scourge in their state. The number of deaths from small-pox has been lessened four times, diphtheria near five times, and typhoid fever more than six times by proper sanitation. As our president said, the death-rate in Michigan is not caused largely by epidemics but by these contagious diseases, which are taking people unawares. And unless you have looked at the subject a little you will be surprised when you do look and see what consumption, typhoid fever, small-pox, scarlet fever and diphtheria, what these diseases are doing for the people. Notice the means of this education.

First, let in more light. Let people know the dangers of the contagious diseases. Let it be known. Again, proper legislation. If the people will not respect the physician's judgment compel them to respect legislation. Again, the press can help by giving the death-rates and by suggesting sanitary methods, and by giving the people ideas in precautionary movements. I don't know that there is anything that will help much more than this. Once more, the medical profession. I will respect in all possible ways the judgment of the physician and the judgment of the board of health. Once more, such conventions as this, and lastly, an eternal agitation. Never let the subject rest. Agitate, agitate all of the time.

DISCUSSION OF THE SUBJECT.

Rev. Mr. Lewis, Charlotte:—There seems to be little that I can add to what has been already said on, "The Education of the People on Sanitary Subjects," and yet to open this discussion perhaps I ought to tarry a moment or two.

I believe of course with most of you, that cleanliness is next to godliness, and I believe that the sooner the people in general are aware of the fact, the sooner will we be free from the scourges that we have heard of and we are all cognizant of. My attention was first called to the subjects that will be discussed here and have already been referred to, some years ago. I was the subject of typhoid fever myself. Had been visiting in the country. I didn't know of course, had no thought upon the matter, no intelligent thought upon the matter at all, why I should be the subject of typhoid fever. But after the thing had passed I naturally was alive to any information I could get; and I became conscious that the fact of my being laid aside from business for some six or eight weeks, and my life being threatened, was directly traced to the yard that was in my close proximity, and I began to look for information about these things.

I remember that the first thing that came to my hand was an article upon typhoid fever. And this leads me to another point, which is this: that sometimes when our knowledge is increased it takes away our idea of a panic. I know of individuals and they were tremendously afraid of coming to our house. As well as I remember now the article referred to was a discussion as to whether typhoid fever was communicable, contagious, or infectious. I believe that was the title of the article. I saw that with necessary precautions it was not contagious, nor was it infectious, and yet it might be communicable. And I saw that if this very knowledge be known in general there would not be the panic that sometimes did occur, and individuals be left to care for their sick, where they might have been helped by sympathy.

It is so in the case of cholera. I knew a clergyman some twenty years ago who was absolutely avoided by the whole neighborhood because he attended the burial of a cholera victim. Indeed in the state of New York today, I presume when there is a case of cholera announced or known to be there, why it hardly makes any difference to the great mass of people. Why it makes no difference is simply because there is a larger knowledge of these things and how they may be prevented, and how these things may be taken, and how they may be controlled.

I remember very well when my attention was called to the study of the microörganisms, that we have felt from our first knowledge that we were afraid to do anything, we could not take a drop of water but that they were crawling all through. And I declare if I haven't felt sometimes like crawling myself and afraid to breathe. It seems that these very things are necessary to our state of existence; and, while there are bacilli, there are other bacilli that eat them and so the thing goes on, and we are not in such a bad shape after all as we think. So it seems to me that the sooner we get a full knowledge of our own make up and of our environments, the sooner and better life would be elevated. For I do think that full health, the best health, the health that is exhilarant in its life is the health that is conducive to the highest morals. There is no question that the individuals who live low lives are the individuals who are lowest in their morals. Every reform should go down to the bottom of

things; for I feel that we must be clean, we must lift them up, we must give the fullest and best life that we have to give—if we want the fullest, highest and best life that can be superinduced upon that.

Mr. Davidson:—I fear that sometimes the Almighty is blamed for what the health officer or someone else neglects. Many cannot understand why it is that they are thus visited by sickness or ailments of particular kinds, when some of their neighbors are not so afflicted. We are especially apt to think that there is the teacher to blame and the Almighty, for what we are personally responsible for ourselves. Let us see to it that we do not do this.

W. H. Sutherland, Oneida:—The thought suggested by the Rev. Mr. Lewis in regard to the germ that we find remarkably prevalent, reminds me of the case of a lady who came to my den, as I call it. I had a little vinegar under a microscope. She looked down into the instrument, and she said: "John, I will not drink another drop of vinegar as long as I live." If people didn't die from any other cause than the proper and constant use of good vinegar, I expect that we could all live much longer than we do now.

It is a want of knowledge of the true sources of danger which causes the danger; and when I saw your announcement that this convention was for the common people I said that I shall be there. We owe it to our families. As a farmer I consider this a very important meeting. As farmers we are milk producers. How many of you realize that in the milk that you consume from the farmer there may lie the seed or the germ of consumption? Few of you perhaps realize that in your ice supply, in your water supply, in your supply of pork or meat of any kind, there may be hidden in these articles of food the germs of disease. How very important such conventions as these are! And I regret that more of our farmers are not here to contribute their little mite, and to receive the knowledge that is possible to get from such learned authorities that we see upon the program. Many of us live many miles from here and could not get here. I felt it my duty to be here and to learn something.

Years ago I became an ardent supporter of the germ theory of disease, when almost every physician in my section laughed at it. Today there is hardly an intelligent physician in the United States but what believes it. I became so interested that I purchased a microscope. Every farmer should know that the milk that comes on his table is free from a dangerous bacillus. It is the duty of every woman to know that the pork is properly cooked. At the World's Fair was a young man who I was well acquainted with, went to a restaraunt; he ate a piece of pork that wasn't properly cooked. That young man today is totally blind from eating food that was not properly prepared. We have a health organization at Grand Ledge. And this winter, as president of that institute, I propose to have some of the boys to address us on the subject of sanitation. We are so near Lansing that I think Dr. Baker can easily come down to Grand Ledge and help us. We want that subject treated just as fully as we can.

G. A. Perry:—The last speaker, Mr. Sutherland, has said that it is quite important that all the farmers be present, and that I suppose includes myself. All the people here should know something about this bacillus in milk. Now it is possible that that question is to be discussed by other speakers here. I ask then for Mr. Sutherland or some of the gentlemen who are here to tell this audience some way of getting at that point, how to discover whether milk is pure or not, free from that germ.

H. S. Maynard:—By drinking it, Mr. President. "An ounce of prevention is worth a pound of cure."

W. H. Sutherland:—The question that Brother Perry suggests is one that requires considerable time, considerable work to demonstrate. One in which a man would need a microscope and some culture material to work with. To tell by test, that is not the question. The question is to know whether it is free or not. It is a question that is for physicians who are practical workers with the microscope, to answer, rather than for farmers who haven't very much time or very much ability in that respect. Something that I haven't succeeded in getting very clearly is the *Bacillus tuberculosis*. I have tried to get it, but have not been very successful. Once I thought I had a very fair specimen. It requires some time and some fine conditions in order to get it.

Dr. Henry B. Baker:—This is a question that I have not prepared to answer, but while waiting for some one else to get ready to talk I might try to answer the question. And I would say that there is another way, besides the one suggested by Mr. Sutherland, to make sure that the milk which is sold and used is free from the germs of tuberculosis.

That particular disease is the most important one of all the dangerous communicable diseases. One-seventh of all the people who die, die of that one disease. Recently it has been learned that there is a way to find out whether an animal has tuberculosis. The germ which causes consumption is now well known. When that germ is cultivated outside or in the body it makes a poison. That poison is called tuberculin. The tuberculin is obtained by cultivating the germ in nutrient material, gelatine or something of that sort. When that substance is injected in the human or animal body it causes fever. If a cow has tuberculosis and a proper quantity of tuberculin is injected under the skin, that animal will have an increased temperature, of several degrees. And this is believed to be a reliable test. By this means, it is possible to find out as regards every animal whether that animal has tuberculosis or not. This is one of the lines of work referred to by the president of the board in his address. I leave with you this question: Whether you will ask the legislature of this State to make it possible to find out whether all the animals are giving us the germs of this terrible disease or not, and to eliminate those which are giving it to us. I suppose the legislature will give it very little attention. If the people of this State will go into this subject and ask the legislature to make it possible to find out whether the cows in this State are giving us milk that is sweeping off one-seventh of our people, it seems to me that it is an important line of work, and that every animal which is tuberculous should be destroyed. It is possible for the germs of the disease to be conveyed through the milk. This most fatal disease is not most generally spread by milk and meat, but it is sometimes thus spread. It is possible to learn of every animal which supplies milk whether that animal is tuberculous, and it is possible to destroy that animal. A little of that work has already been done around the State. It has been taken up by the manager of the Sanitarium at Battle Creek. Dr. Kellogg, who has charge there, will buy no milk except from cows which are known to be free from tuberculosis. On the other hand the milk dealers didn't like to lose the custom of the Sanitarium. They wanted to know how this test could be applied. Dr. Kellogg agreed to go and make this test. Now what is practical for the Sanitarium is practical for the people of

Charlotte or in other places. Be certain that the milk is absolutely free from the germs of tuberculosis.

Question:—I would like to ask one question. I want to know if it affects the butter, if we get it in the butter?

Answer:—Whatever is in the milk may affect the butter. The most of the organisms would possibly settle, and the butter may be less likely to be affected. The organism is slightly heavier and would tend to go to the bottom.

Question:—And cheese?

Answer:—And cheese too. It would be more likely to be in the cheese than in the butter.

H. S. Maynard:—I notice that almost every speaker here has been advocating the benefit of asking the legislature to pass laws with reference to sanitation. I am at loss to know why that should be asked this convention, as nearly all the audience are not voters. One reason why they insist upon that so frequently is perhaps because we have one of the legislature with us, and I think they take the opportunity of asking him. I would like to ask the last speaker if there is danger of other diseases from the use of milk than tuberculosis. The danger may arise from the way the cows are cared for and pastures they run in.

Dr. H. B. Baker:—I suppose there is danger of spreading other diseases than consumption by the use of milk. Quite a large number of outbreaks of typhoid fever have been traced to milk. But it is usually caused from the water that some-how-or-other gets into the milk. A great many outbreaks of typhoid fever have been traced to milk. I remember a very notable one in which the water probably was that which was used to cool and rinse the receptacles which contained the milk. Diphtheria and scarlet fever outbreaks have also been traced in that same manner. In consumption we have a way of absolutely preventing it, in my opinion. In these other diseases it is the ordinary way of isolating the person who has the dangerous disease.

Dr. Mary E. Green:—Will you please tell us whether you think the cows get tuberculosis from human beings or human beings from the cows?

Dr. Henry B. Baker:—Both. Undoubtedly we get tuberculosis from animals, and undoubtedly animals get tuberculosis from us. Animals also spread the disease among themselves. Recently on one of the largest farms in this State the owner applied the test I have been speaking of to three animals, which proved that the sickest animal did have tuberculosis. That animal was immediately slaughtered, and found to be tuberculous. One of the other animals stood next to that one, and next to the second was a third animal. The second animal responded but the third animal did not respond to the test. They thought they would kill all three of the animals and see whether the tuberculin test proved true. The third animal that did not respond to the test was found to be free from tuberculosis.

The second animal had contracted the disease standing next to the sick one and probably inhaled or took in the germs with its food; and that is undoubtedly the way we contract this disease. The sick animal had coughed and scattered the infected matter about in its immediate vicinity.

Mrs. Merritt:—I would like to ask if boiling the milk would not destroy the germ?

Dr. Baker:—It will.

Dr. Mary E. Green:—I believe that there is no food in which we take so much poison into our systems that we do in milk. The whole process of caring for milk is necessarily one that demands a very great deal of cleanliness. I wish it might be said that we of this country take the precautions that they do in France and Germany. They never use milk there under any conditions without first boiling it. They never make butter until the milk is first boiled.

A short time since I was in Chicago, attending a Pure Food Exhibit, one of the largest exhibits of that kind ever held. The gentleman in charge, Dr. Peck, is one of the brightest physicians I have ever met. He has charge entirely of the milk. The examination of the milk is his particular charge. He examines every specimen of milk that is brought in every day. They also examine for the oil or cream. They demand absolute cleanliness in the stables and of the milkers. I want to make a special point that they would not allow any ensilage to be fed to these cows. I thought a good deal about that, because some of our farmers feed ensilage to their cows. I believe that if every farmer would be as particular as those farmers are obliged to be, that we certainly would have more cleanliness in the butter. I believe a great deal of it comes from careless milking, unclean stables, and from careless house-wives, and especially in the care of the cows.

Question:—Does boiling the milk affect the making of the butter?

Answer:—In the winter time it is quite customary with the farmers' wives to scald the milk to facilitate the raising of the cream. The housewives who properly scald the milk in the winter make very excellent butter.

Question:—I would like to ask if in sterilizing milk it is not always necessary to first lower the temperature before carrying it up?

Answer:—No, not necessary, but desirable. Lower it afterwards. The idea is held by some that the temperature of the milk should first be lowered so that the animal heat is taken out, and the rapid reproduction of germs prevented. In some of the dairies where they furnish milk for the cities they have machines for such purpose.

Rev. E. G. Lewis:—In one district in Chicago I know that every farmer that sold milk to certain venders in the city was required to take the animal heat out. And also those in the same neighborhood who sold cheese were obliged to take out the animal heat first.

Mr. ————:—Milk as soon as it is taken from the animal should be placed upon ice, at least the temperature should be lowered.

Dr. Mary E. Green:—One reason for carrying it up to the boiling point, or raising the temperature, is that the bacteria in the milk will be destroyed.

W. H. Sutherland:—Is it not a fact that some doubt that one hundred and eighty degrees will destroy the germs in the milk? There are some who claim that over two hundred degrees is necessary to free the milk from the bacteria.

Answer:—I think that the organisms are destroyed at that temperature.

The following paper was not read (except by title) but an outline of the paper was placed before the Executive Committee of the Convention, and the members of the State Board of Health and it was unanimously voted that the paper should be printed in the pamphlet proceedings of the Convention. The paper is as follows:—

RABIES—HYDROPHOBIA.*

BY THEODORE R. MAC CLURE, LANSING, MICHIGAN.

INTRODUCTION.

Rabies is a disease common to both man and animals, and can be classed with the diseases dangerous to the public health. Rabies in man may be attended with one symptom which is spoken of as "fear of water" from which the term *hydrophobia* originates, but really there is no great difference between the rabies of man and the rabies of animals. Water and other liquids or even a draft of air from a window or from a fan may cause the spasm or convulsion. The spasm caused by water has led to the term hydrophobia. Many writers seem to favor using the term hydrophobia when speaking of rabies in man, and rabies when speaking of the disease in animals, although technically speaking there is no such disease as hydrophobia. It seems, however, to be a convenient usage of terms; and I may in the pages following use the term hydrophobia when speaking of rabies in man and rabies when referring to the disease in animals.

Through my work in the office of the State Board of Health, in giving attention to the reports of alleged outbreaks of rabies and cases of hydrophobia, I have become much interested in the subject. The disease does not cause three thousand deaths in man in Michigan every year, as does consumption, nor does it cause such great mortality in the human race every year as does diphtheria, scarlet fever, typhoid fever or measles, but I presume there is no disease to which the human race is heir that causes more fear or consternation than does a case of hydrophobia or rabies. Many people think that small-pox is a dreadful disease and causes many deaths, but I presume that a yearly average for the last ten years will show that there have been in Michigan not many more deaths from small-pox than from hydrophobia. Neither small-pox nor hydrophobia is as frequent as it was many years ago, when preventive medicine was not known. In 1780 JENNER discovered preventive vaccination against small-pox, and in 1885 LOUIS PASTEUR discovered the preventive treatment against hydrophobia and rabies, and to-day millions of people are being vaccinated every year to protect themselves against an attack of small-pox, and thousands of people having been bitten by dogs or other animals known or supposed to have been mad, have received treatment which has generally insured them against the development of that fearful disease—hydrophobia.

I am sorry that I am not in a position to give the results of some original researches as are most of the persons who attempt to write on this subject; but, as that is one of the impossibilities, I will endeavor to reiterate only

*A paper read by title at the SANITARY CONVENTION, held under the auspices of the State Board of Health, at Charlotte, Michigan, November 22 and 23, 1894.

NOTE.—In the preparation of this paper, especially that portion relating to Etiology, I am indebted to the kind assistance of DOCTOR GEORGE H. CATTERMOLE, of Lansing.

what has probably already been said. My object in writing this paper is to place before the people some facts which may be of interest to them and may directly or indirectly be the means of saving some human lives, because it does not seem to me that there is any necessity for persons bitten by rabid animals to suffer the agonies which are attended with death from that terrible disease.

EARLY HISTORY.

Rabies has existed for many centuries; and, as the disease may occur in almost any warm-blooded animal, it is not at all improbable that there may have been cases of rabies soon after the creation of animals as mentioned in the first book of the Bible. As the disease most frequently occurs in dogs, I presume that history would record cases as early as 1,500 years before Christ, for about that time dogs were mentioned by MOSES, and about 32, Anno Domini, dogs were spoken of as "eating the crumbs which fall from their master's table."

The early history of canine rabies is somewhat obscure, but, whenever spoken of by the early writers, it seems to be dreaded as much as at this period. PLUTARCH says that hydrophobia was first observed in the days of ASCLEPIAS, the God of Medicine. ARISTOTLE spoke of canine rabies, but thought the disease was never communicated to the human race. CELSUS gave the subject especial attention and believed that, on account of a morbific virus, the bite of all animals was dangerous. OVID states that hydrophobia and gout were in his day reckoned among the incurable diseases. During the first centuries of the Christian era considerable attention was given to the causation and treatment of hydrophobia. Many different theories as to its causation were advanced, but PEDANIUS DIOSCORIDES was probably about the first (in the fourth or fifth century, Anno Domini) to give an exact description of the disease. In his work on "Materia Medica" he mentioned its tranmissibility from animals to mankind, its certain fatality when once developed, and its prevention by cauterization. But up to the eighteenth century there was little progress made in ascertaining the nature and causation of rabies or hydrophobia and their restriction and prevention.

As early as 900, Anno Domini, outbreaks of rabies were recorded. "One day a mad bear, following the course of the river Saône, at last reached the quay at Lyons. Everybody fled at its approach, except some boatmen who, armed with heavy sticks, attempted to kill it. The bear, however, little intimidated by their number, rushed amongst them and bit many—about twenty. Of this party six were smothered in about twenty-seven days on account of fearful madness. The other fourteen, however, had thrown themselves into the river to escape the animal's attacks, and having to swim to the opposite bank, where thus preserved from the effects of the poison; the water of the river had saved them, for in beating against their wounds, it had washed away the venom." * In the sixteenth century, according to FLEMING, rabies was reported in Spain, Flanders, Turkey, Hungary, Austria, et cetera, and in Hungary in 1712 wild beasts of all kinds went mad, as did also many persons, and in England many dogs went mad and bit many people. "In 1768 rabies was alarmingly frequent in Boston and other towns of North America," and a few years later in Boston

*FLEMING'S "Animal Plagues," 1871, page 51.

and vicinity rabies was present in dogs and foxes, and swine were the principal victims of the animals' rage.

It is useless to cite further outbreaks of rabies and hydrophobia, for during the fifteenth and sixteenth centuries and up to the present time history is prolific with outbreaks of the disease in animals and in man. One has but to read FLEMING'S work on "Rabies and Hydrophobia" to become thoroughly convinced that these diseases were frequent and widespread, causing great destruction of property and human lives.

ETIOLOGY.

Some observers have thought that rabies might occur spontaneously in animals but I think there is not now much question but that most, if not all, the rabies comes from a previous case and is due to a specific poison which has been inoculated into the animal, generally by the bite of another animal. It has been claimed that certain conditions either directly or indirectly were the cause of the disease, but the recognized authorities now believe that neither climate, season, sex, age, etc., cause the disease, although they may have modifying influences.

We now know that the disease arises from the inoculation of the specific virus which seems to be more abundant in the saliva than any other secretion of the body. ROLL, FLEMING and others believe the poison is present in the blood and consequently in all parts of the body, but other authorities have failed to cause rabies by inoculation of the blood of rabic animals. M. GALTIER has shown that the saliva of animals dead of rabies or killed after having developed the disease does not lose its virulence for some time after death. Animals inoculated with the fresh saliva, blood, et cetera, do not always contract the disease, on account of some animals being less susceptible than others. FLEMING says that "dogs and cats hold the first place in the scale of susceptibility; then man and pigs; next ruminants, the sheep and the goat being more susceptible than the ox, and lastly the horse." RENAULT inoculated ninety-nine animals (horses, dogs and sheep) and only sixty-seven were affected with the disease. ROLL says that successful inoculations vary from twenty-four to seventy per cent., whilst from the bite of dogs it varies from twenty to seventy per cent., showing that the disease is less liable to be produced by the bite of a rabid animal than from experimental inoculation, which can probably be attributed to the fact that experimental inoculation occurs under different conditions than does the bite, and that their hair, et cetera, protect the animals somewhat from the introduction of the specific virus. Then, again, it is not so sure that the poison is really inoculated by a bite as by experimental inoculation.

The etiology of rabies is still questioned,* but many of those who at first doubted its specific character, and its transmission by inoculation, have, on continuing their experiments and improving their methods of operation, come to conclusions almost identical with those of PASTEUR and his school.† Among the class of writers, who draw their conclusions from experimentation, there is a consensus of opinion that the disease is due to inoculation with virus containing the specific cause of the disease.

* DULLES: *The Medical Record*, 1877, page 672; *The Medical News*, 1894, pages 653—655. STOCKWELL BRILL, SPITZKA, JOHNE; *Jahresbericht*, 1889. Von Frisch, Vienna.

† PROFESSOR A. HOGYES: "Die Experimentale Basis der Antirabischen Schutzimpfungen Pasteur's," Stuttgart, 1889.

DANA says:—"In order to prove that a certain disease is autonomous, distinct and special we must establish the fact that its etiology and its clinical history are essentially uniform, or that the anatomical changes found after death are the same, or that inoculations of animals with the secretions or tissues of the victims of the disease reproduce the disease."

With regard to his first requirement—uniform etiology—there is not a case on record where rabies appeared in an animal without its having been inoculated with material from another animal which is suffering from the same disease. Usually the infection in man can be traced directly to animals suspected from their actions, of having rabies, but in some cases the injury is considered as a simple abrasion until the characteristic symptoms appear.*

DOCTOR PAUL GIBIER states, in a letter to me, that—"The disease may be communicated by a rabid dog licking the bare part of a person's skin on which some slight abrasion exists."†

As to the second of DANA'S requirements—a uniformity in the clinical history—while the symptoms vary some in different animals, they are very uniform for any certain species, as the extended irritative period (furious rabies) in the dog, and the more marked stage of paralysis in the rabbit.

There are many good reasons for believing that rabies is due to microörganisms, whether a single species or not, we cannot say; different investigators find different microscopic forms present in the victims of the disease (as FOL'S micrococcus, BABE'S bacillus, et cetera, and GIBIER'S micrococcus),‡ and the symptoms vary enough to make a mixed infection possible.

There is strong evidence in favor of the belief that rabies is due to some biological factor or living cause; this may be a bacterium, or one of the lower animal forms, as protozoa, coccidia, or psorosperm. Considering the period of incubation, the fact that minute quantities when inoculated will cause the disease, and the ease with which the virus is rendered inert, by means which, while sufficient to destroy low forms of living organisms, do not change the chemical products contained therein, we see at once the resemblance between the properties and action of this virus and that of other diseases which are known to be due to microörganisms, and it is evident from the following facts, that the causal agent is something capable of reproduction and growth, and not a chemical poison contained in the inoculating virus: (a) filtration removes the virulent matter from the emulsion; (b) a longer or shorter period occurs, between the inoculation and the onset of the disease, in which time (period of incubation) the cause, if a biological one, has an opportunity of increasing; and (c) the exposure of rabic virus for one hour to a temperature of 50° centigrade (122° Fahrenheit), or to desiccation and direct sunlight for three hours will destroy the virulence, and exposure to a one per cent. carbolic acid solution, or to a one-tenth per cent. corrosive sublimate solution, for three hours, renders the virus inert.§

PASTEUR, ROUX, CHAMBERLAND and others made careful search for microörganisms in the various tissues of animals affected with rabies; small

* "American Reference Hand-Book of Medical Science," Volume VI. Ruffer: *The British Medical Journal*, Volume II, 1889, page 687.

† WELCH on "Hydrophobia"—"Transactions of the Maryland Medical and Chirurgical Faculty," 1889. In the *Annals de l'Institute Pasteur*, 1889, was published an account of the cases of Pierre Butt and his wife, who were licked on open wounds by a rabid dog. Butt was given antirabic treatment and did not have rabies; his wife declined treatment and died of the disease.

‡ STERNBERG'S "Manual of Bacteriology," 1892, page 522.

§ BIGGS: "Transactions of the New York Academy of Medicine," 1891. WELCH: "Transactions of the Maryland Medical and Chirurgical Faculty," 1889.

bodies were seen in the medulla which were thought to be micrococci, but later these were considered as having little or no relation to the disease. In 1884 GIBIER described his observations of supposed micrococci in the medulla of animals dead of rabies.* In 1885 FOL was able to demonstrate small granules resembling micrococci in the lymph spaces of the cord taken from animals which had died of this disease; thin sections of the cord were stained after WIEGERT'S method, with a solution of hematoxyline. BABES † describes his observations of organisms resembling micrococci in the brain and cord of animals suffering from rabies, which are stained a rose color by LOEFFLER'S alkaline methylene blue solution. He has succeeded in making cultures of this germ, which will cause symptoms of rabies when injected into animals, but not in all cases.

Curve-shaped bacilli and spindle-shaped bacilli are described as being present in the brains of animals, and thick, curved motile bacilli are said to be found in the blood of rabbits during the stage of fever. ‡

In the opinion of STERNBERG death is caused in cases of rabies by the action of a potent chemical poison of the class of toxalbumins, which is possibly the same as the substance which PASTEUR calls *matière vaccinale* contained in the emulsion used in the antirabic treatment and supposed by him to produce the immunity. He says it is contained in the inoculating material, but is not identical with the microörganism causing rabies.

It has been found by experimentation that if large doses of the strong virus are injected into the subcutaneous tissue the animal is less likely to contract the disease than when a small amount of the strong virus is used. FERRAN requires that his patients agree to finish the treatment before he gives them the first inoculation, because, he thinks that the immunity is in proportion to the amount of virulent virus used. BAREGGI lost five patients by using the superintensive method, which misfortune FERRAN attributes to using too little of the virus. These results may be due to the large amount of chemical product (toxalbumin) contained in the large dose being sufficient to prevent the growth of the microörganisms, or the poison may so stimulate the tissue cells that they are able to cope successfully with the living matter contained in the emulsion.

PASTEUR and others,§ I believe, have studied the action of these chemical substances found in the emulsion, et cetera. It would seem possible in reviewing the results obtained from the use of antitoxins in diphtheria, malignant edema, anthrax, et cetera, that the use of the sterilized emulsion of rabic medulla, when used in the proper amount, might give immunity from rabies.

The specific cause of the disease seems to select the central nervous system as its most favorable habitat. It is usually present in the saliva and salivary glands of dogs, as demonstrated by inoculation of other animals with this material being followed by rabies, but whether the saliva of men who have the disease is infectious is an open question. LAGORIO writes me that he has made a number of experiments with the saliva of three rabid men, and in no instance did rabies develop in the inoculated rabbits.

In BARDACH'S experiments the juice from the salivary glands of twenty-two persons who died of rabies caused the disease when injected into rabbits. BORDONI and UFFREDDUZZI made similar experiments in two

---

* Published at the School of Medicine, in Paris, 1884.
† "Les Bacteries" (second edition).
‡ WOODHEAD: "Bacteria and their Products," page 317.
§ TIZZONI and CENTANNI—"Chemical Vaccine Against Rabies:" *The British Medical Journal*, Volume 1, 1893.

cases with negative results. The glands, in BARDACH'S experiments, were not removed until twelve or twenty-four hours after death, while those used by UFFREDDUZZI were removed in three to six hours after death; post-mortem changes may have occurred in the former.

The statistics of the PASTEUR Institute in Moscow,* for 1892, give two instances where the disease was communicated from man to man. DOCTOR CALMETTE reports one instance of the disease being contracted from the bite of a man, as having occurred in the Cochin China Institute.*

PATHOLOGICAL ANATOMY.

There is "an acute hyperemia of the larynx, trachea, and bronchi" (OSLER), and GOWERS says there is "perivascular exudation of leucocytes, and minute hemorrhages, in the oblongata." This is found more marked in the animals which survive for some time, and is known as miliary abscess.† In man where the disease is so rapidly fatal this condition is not so well marked, but in men who died of paralytic rabies these changes resemble those found in the medulla of the rabbit and may be widely diffused.

WELCH, in describing the lesions he had observed in the post-mortem examination of three cases of rabies, says: "These lesions were microscopical, and their extent and distribution could be determined only by the examination of a large number of sections of different parts. The lesions were especially well marked in and near the nuclei of origin of the spinal accessory, pneumo-gastric, and glosso-pharyngeal nerves, and in the motor nucleus of the trigeminus."

That the pathological anatomy does not show the extent and presence of the specific cause is obvious, as tissues or fluids from various parts of the body of infected animals when inoculated into healthy animals will produce the disease, although nothing can be demonstrated in the tissues or fluids to account for the disease.

SYMPTOMS IN ANIMALS.

There are two distinct varieties of the disease—the maniacal and the paralytic. The disease has three well-marked stages—prodromal, irritative, and paralytic.

The *prodromal* stage in rabies is characterized by an alteration in the manner and usul actions and habits of animals. If the disease occurs in a domestic animal which is naturally friendly, it may suddenly change, become cross and surly, and almost as suddenly again become natural and affectionate. The animal is restless and not contented to remain in one place. Many animals are dull, lazy and seek secluded places. There is irritation at the seat of the wound demonstrated by a tendency to scratch, rub or ruffle the cicatrix. Frequently the appetite is lost and, in others there is a depraved ravenous appetite, evinced in dogs and pigs by eating all sorts of strange things, such as pieces of wood, and iron. Carnivorous animals "gulp" as if trying to free themselves from something, such as a bone in their throat, and vomiting frequently occurs. The visible mucous membranes are red and saliva (except in horses) drivels

* Statistics from various PASTEUR Institutes will be found on subsequent pages of this paper.
† BARSTOW and HORSLEY: "Transactions of the Clinical Society of London, November, 1888."

from the mouth. These symptoms generally last from twelve to forty-eight hours, and then pass either to the irritative or paralytic stage.

During the *irritative* stage there is great propensity to injure other animals, uneasiness, paroxysms of fury, with intervals of quietude, and exhaustion. During the paroxysms dogs may tear their bedding, or whatever comes in their way, and snap at imaginary objects. The tongue is swollen and frequently dipped in water to cool it, but the poor animal may not be able to swallow and saliva hangs in strings from its mouth. However, in some animals this symptom is not so bad, and the animal wants and takes a great amount of water. The gait or carriage of a dog is unsteady and he soon begins to totter. The dog generally goes with an unsteady gait, tail between his legs, bright and staring eyes that soon become dull, head rolling from side to side, stomach tucked up, mouth open and tongue protruding. It is said by those who have seen them that it is quite easy to distinguish a mad dog by the actions above described. In FLEMING'S work on "Hydrophobia and Rabies" can be seen a picture of a rabid dog, and it is probable that a person would never forget it should he once see one. A peculiar characteristic of a mad dog is that he is devoid of sense of pain and will hold a red-hot iron in his mouth without uttering a cry.

Cats are very savage and are very dangerous on account of their great ferocity. Horses become violent, stamp their feet, kick, bite, et cetera, and try to get loose. Cattle rarely use their teeth but paw and bellow, and use their horns and frequently break them. Pigs slaver at the mouth, bite at their fellows and become very wild. The voice of all animals is altered and strange. In dogs the voice is one of the best diagnostic symptoms. It has a peculiar high-toned, croupy, ringing sound, as if the bark and the howl were blended together. At first the paroxysms are prolonged and violent, and finally become weak and short, and it may then be said that the paralytic stage has set in.

In the *paralytic* stage there is paralysis of the lower jaw, which renders the animal unable to bite. The dog generally stays at home. If he does go away he quickly returns, and seeks some secluded spot, in which he may die. The tongue is swollen, livid and hangs out of the mouth; the saliva is tenacious and abundant, paralysis of the posterior extremities sets in and death soon follows.

Rabies generally makes quick work of the animal, and may take a rapid course and kill within forty-eight hours. It rarely lasts more than ten days, although there have been cases of canine rabies lasting twenty days. The duration depends largely upon the constitutional vigor of the animal.

Hydrophobia is an affection of the nervous system, and the stimulus which excites the paroxysm is conducted often from the ganglia of special sense, or even from the brain, so that the sight or sound of fluids, or even the idea of them, occasions equally with their contact, or with that of a current of air, most distressing convulsions (CARPENTER).

SYMPTOMS IN MAN.

There are many points of similarity between the symptoms of hydrophobia and those of rabies. There is some sense of pain in or near the seat of the wound, extending toward the body, if the injury had occured on the limbs. There may be considerable irritation or very acute pain in the cicatrix. The old wound may swell and open, or, if yet unhealed, assume

an unhealthy appearance, discharging a thin, ichorous fluid instead of pus. Usually there is a general nervous disturbance; the patient becomes dejected, irritable and restless, but does not appear to have any idea of what may be the cause of his peculiar feeling, or, if he does, he is careful not to mention it; he seeks solitude or amusement away from home; his sleep is troubled; he often starts up from a sound sleep; pains are often experienced in different parts of the body; and frequently there is disorder with the digestive apparatus. After these premonitory symptoms, which vary from a few hours to a few days, the patient becomes sensible of a stiffness or tightness about the throat and he experiences some difficulty in swallowing, especially fluids, which may be considered as the commencement of the attack in man.

The difficulty in connection with swallowing rapidly increases and soon becomes quite impossible, unless it is attempted with determination, which generally throws the patient into convulsions; there is a sensation of tightness in the chest, as well as throat; difficulty in breathing and necessity for fresh air. The most marked symptoms are the spasms or convulsions which are brought on by an attempt to swallow, or may even be brought on by the mere mention of liquids or knowledge that they are near, or by a draft from the window or fan. The sound of a liquid being poured from one vessel to another, or the application of any cold or damp substance to the body may bring on the paroxysms. The patient's face wears an expression of terror, anxiety or despair. During one of these convulsions the patient suffers great agony and it is quite impossible to stand by and witness the suffering. The spasms generally last but a few seconds and the patient then becomes tranquil, but the least disturbance may bring on a fresh attack. During the intervals between the spasms, the patient is calm, rational and may feel thirsty, but on trying to drink is uniformly thrown into another convulsion. The patient is frequently aware of the approach of these attacks, and, fearful of doing injury, begs to be restrained. The patient may be troubled with hallucinations of both sight and hearing. Sometimes the patient gives away to wild fury, may roar, howl, curse, strike, may try to bite others or himself, and finally, through exhaustion, will sink into a gloomy and sleepy state, until attacked by another paroxysm. The tongue is swollen and red, there is often a sense of burning in the throat, with thirst which cannot be satisfied. There is generally a secretion of a viscid tenacious mucus in the fauces (called the "hydrophobic slaver"), of which the patient makes every effort to free himself and spits it out to drop wherever it may. This mucus is generally abundant as the disease advances and the lower jaw is frequently paralyzed, and the mucus flows from the corners of the mouth. Paralysis may become quite general before death. There may occur times during the disease that the patient may take both food and water without the convulsions, but it is always with much difficulty. The temperature gradually rises from the commencement of the disease, and frequently as high as 105° Fahrenheit and 106° Fahrenheit. Death generally follows after a hard convulsion. The desire to bite is rare in man, but cases are recorded where the bite of a man has caused the disease.

The duration of the disease is somewhat varied, lasting from two to ten days. In 324 cases death occurred in the majority of cases between the second and fourth days, in a few death occurred the first day, and in a few cases life was prolonged even to fifteen days.

PERIOD OF INCUBATION IN MAN.

The period of incubation is that time between the bite and the appearance of the characteristic symptoms of the disease. During this period the patient often experiences unnatural conditions. These conditions have been described on preceding pages of this paper under the head of prodromal or premonitory symptoms.

Much attention has been given to the subject of the period of incubation; and, although there has been found no fixed number of days in which the disease will surely appear, if at all, in most cases the disease shows itself between forty and sixty days. The period has frequently been much less, and even as short as one day in some cases, and in other cases as long as two and one-half or three years. ROUCHE has observed that in Algiers the average period is fifty-one days, the ordinary minimum thirty days and the maximum ninety days. DOCTOR FLEMING records 224 cases in which the latency was less than a month in 40, from one to three months in 143, from three to six months in 30, and from six to twelve months in 11 cases. TROUSSEAU says the incubation period may vary from a few days to a year. HAGUENOT cites a case where a peasant was suffering from hydrophobia on the third day after receiving his wound from a mad wolf. FINCO, of Padua, cites a case where a young woman developed the disease 14 years after being bitten by a mad dog. Instances of extremely short or extremely long periods of incubation are recorded but it is possible that there are mistakes made as regards the date of receiving the bite which causes the disease.

DOCTOR BAUER recorded his observations on 510 cases and found that the average period was 72 days. In the male the average period was 80 days, and in the female it was 65 days. He thought that age had considerable influence and that the period was shortened 20 days in patients under fourteen years of age. He found that in

49	cases	where a	wolf	caused	the	bite,	the	av.	incubation	period	was	39 days.
293	"	"	" dog	"	"	"	"	"	"	"	"	73 "
2	"	"	" fox	"	"	"	"	"	"	"	"	33 "
31	"	"	" cat	"	"	"	"	"	"	"	"	80 "
1	"	"	" cow	"	"	"	"	"	"	"	"	30 "

DOCTOR KRAIOUCHKINE, director of the Saint Petersburg Institute, informs me that his experience, during the years 1886 to 1892, leads him to announce that the period of incubation varies from 16 to 494 days; the average period being about 60 days.

DOCTOR AUGUSTO F. DES SANTOS, director of the Pasteur Institute at Rio Janerio, writes me that his oxperience indicates that the period of incubation is from 30 to 90 days.

DOCTOR PADILLA, of the National Department of Hygiene of the Argentine Republic, states that in cases he has observed the average period was 40 days.

DOCTOR A. N. BLODGETT, of Boston, says that in seventeen per cent. of all cases of rabies in man the period is three months or over.

PASTEUR says that the disease shows itself in a majority of cases in 40 to 60 days after receiving the bite, which is probably the period which will most commonly be observed. However, the location of the bite has

much to do in influencing the time of the appearance of the disease. It has been found that where the wound was located on the head or neck the incubation period was 35 days, on the upper extremities 81 days, and on the lower extremities 74 days.

In India, in 1893, it has been observed that in the cases of hydrophobia, the period of incubation was uniformly about 90 days.

INCUBATORY PERIOD IN ANIMALS.

In regard to the period of incubation in animals, DOCTOR FLEMING, in his exhaustive work, "Hydrophobia and Rabies," gives detailed and elaborate results of different observers. LAFOSS states that the shortest authenticated period in the *dog* that occurred in his experience was 7 days and the longest was 155. BLAINE asserts that the majority of cases occurred between the third and seventh week. HAUBNER'S experience in 200 cases showed that in 83 per cent. the period was within two months; the average being three months.

With the *cat* the incubatory period is said to be from two to four weeks.

According to RÖLL the period in the *horse* varies from 15 days to two months.

HAUBNER found that in the *ox* that it varied from nine days to several months. In 234 cases 10 per cent. developed the disease in about three months.

In *sheep* two weeks seem to be the minimum and four weeks the maximum.

Pigs occasionally develop rabies in nine days, but it does not usually appear until the fourth week after infection.

THE PASTEUR TREATMENT.

Prior to October 26, 1885, when M. PASTEUR announced to the Academie des Sciences de Paris that he had discovered a treatment which would prevent the development of hydrophobia in man, it was conceded generally that hydrophobia was always fatal. Imagine the great surprise and wonder which followed the announcement of this great discovery, second only perhaps in importance in preventive medicine to that of JENNER.* It is not, however, to be wondered at that the suspicious and incredulous were ready to question the efficacy of the treatment, but it is now gratifying to say that the method has been thoroughly tested by scientific men all over the world and there is probably now no doubt in any informed mind but that LOUIS PASTEUR is a great benefactor and has done much to relieve suffering humanity.

The careful and unbiased experiments of DOCTOR ERNST, of Boston, DOCTORS WELCH and KIEBLE, of Baltimore, DOCTOR SHAKESPEARE, of Philadelphia, and others in this country have fully confirmed the statements and methods of M. PASTEUR and his illustrious co-workers in Europe.

Before PASTEUR announced his discovery, he and other experimenters spent much valuable time in trying to bring about the same results, but

* Up to this time the antitoxin treatment of diphtheria has not been universally adopted.

PASTEUR was first to make his method public, and has since treated many persons proved to be or supposed to have been innoculated with hydrophobic virus. At first his inoculations were made at his laboratory in the Rue d'Ulm; but since the method came to be recognized by nearly all the world, a grant of several million francs, from the Imperial Treasury, for a new laboratory and its equipment, and a donation of a whole block of ground in the heart of that great city, PASTEUR has built and is now occupying a magnificent institute, standing back from the street, occupying the block donated by the city and surrounded by a beautiful grass-plot. In front on the lawn will be found a bronze statue representing a boy struggling with a mad dog which indicates at least one branch of work carried on inside the building. This well-equipped laboratory is occupied by PASTEUR and his corps of untiring searchers for knowledge, ever trying to discover some new vaccine or other preventive of disease. The laboratory is for practical work in different branches of micro-biology, and associated with PASTEUR are some fifteen directors and assistants. Among these valuable assistants may be mentioned such notables as ROUX, YERSIN, METSCHNIKOFF, STRAUS, DUCLAUX, CHANTEMESSE, GRANCHER, and others, each working in his special line.

In way of digression, and as an instance of some of the recent valuable work coming from this institute, I might mention that it was DOCTOR ROUX, of the Paris PASTEUR Institute, who, at the meeting of the International Congress of Hygiene and Demography, at Budapesth, September 1 to 9, 1894, gave to the congress and to the public the results of his experiments in connection with the treatment of diphtheria by the immunizing blood serum of the horse. While DOCTOR BEHRING practically left his method a secret, DOCTOR ROUX revealed every detail of his method, and offered to supply the serum, and made known his intention to give his time to the prevention of diphtheria.

One can well see how a man of PASTEUR'S temperament should have such a deep interest in a disease attended by such fearful suffering for both patient and friends. It was in 1880 that he began his study of the etiology of hydrophobia. He obtained from a child suffering with the disease a small quantity of the saliva and injected it under the skin of a rabbit; the animal died in two days. Taking some of the saliva of this rabbit, he treated another rabbit, and in that the disease was produced in a most virulent form. Continuing his experiments he found that by trephining a healthy rabbit and taking a few drops of the cerebro-spinal fluid and injecting it under the dura mater of the healthy rabbit the disease rapidly developed and with more certainty than by the use of the saliva, but was not of so virulent a type. Fragments of the brain and spinal cord also produced the disease, and he then abandoned the use of the saliva. Knowing by previous experiments with anthrax virus that the virulence of the virus might be increased or decreased by inoculation into animals of another species he followed out the same lines of work with hydrophobic virus and obtained similar results. Inoculation from dog to dog killed at the same period of incubation and in practically the same time; but inoculation from dogs to monkeys gave a weaker or more attenuated virus, the virus becoming more attenuated by successive inoculations from monkey to monkey, until there came a time when the virus was so weak that it would fail to cause the disease. If this weakened virus were then inoculated into a rabbit or dog it remained inactive for a

time, but by successive inoculations the virus regained its original virulency. However, if these series of inoculations be made into a rabbit with the primary virus from a dog the virus gradually grows stronger instead of weaker until it is even more malignant than the fresh virus from a dog suffering from street rabies. For instance, if a rabbit be inoculated with the virus of a rabid dog the rabbit will show symptoms in about fifteen days, never shorter than nine days; if, however, the virus of this first rabbit be used on a second rabbit the period of incubation is shorter; if a third rabbit be likewise treated with the virus of the second, the period is still shorter, and so on until it is reduced to six or seven days, at which time the period of incubation becomes stationary or what PASTEUR calls a "fixed" virus; that is, the period of incubation is always six or seven days, and the animal certainly dies on the tenth day after inoculation. This discovery was of great importance to PASTEUR, as he was able to determine exactly when the animal would die, and was able to obtain a fixed and regular supply of virus for his every-day inoculations.

PASTEUR had observed that the spinal cord of rabbits dead from rabies gradually lost its virulence in direct ratio to the time intervening after the death of the rabbit. This and other facts lead him to believe he could obtain an inoculation material of different degrees of virulence, which could be relied upon for the treatment of human beings. Accordingly he injected a rabbit with the "fixed" virus, and when the rabbit died the spinal cord was hung in a dry, sterilized bottle and kept at a temperature of 17° centigrade to 18° centigrade (63° Fahrenheit to 65° Fahrenheit).

The cord of "one day" drying was found to be slightly weaker and when injected into another rabbit still produced the disease, but the death of the rabbit was prolonged just one day more than it would have been had the rabbit been inoculated with the fresh virus. Inoculation with the spinal cord of two days' drying prolonged life in the rabbit one day longer. He found that the virulence decreased in direct proportion to the temperature and the length of time it had been dried, the weaker the injecting emulsion, the longer the period of incubation and the longer death was delayed; the cord that had been dried fifteen days nearly uniformly failed to produce the disease; and the cord that had been dried only one day was nearly as strong as the first virus.

DOCTOR UFFREDDUZZI* found that if the cord was dried—

2	days	it	produced	death	in	11 to 17	days,	but	postponing	it	1 to 2	days.
3	"	"	"	"	"	14 to 16	"	"	"	"	4 to 6	"
4	"	"	"	"	"	12 to 15	"	"	"	"	2 to 5	"
5	"	"	"	"	"	17 to 20	"	"	"	"	7 to 10	"
6	"	"	"	"	"	12 to 22	"	"	"	"	2 to 12	"
7	"	"	"	"	"	23 to 29	"	"	"	"	13 to 19	"
8	"	"	"	"	"	24 to 27	"	"	"	"	14 to 17	"
9	"	"	"	"	"	27 to 40	"	"	"	"	17 to 30	"
10	"	"	"	"	"	32 to 36	"	"	"	"	22 to 26	"
11	"	"	"	"	"	30 to 35	"	"	"	"	20 to 25	"

* From a paper by DOCTOR RUFFER, read before the Section on Medicine of the British Medical Association, at Leeds, August, 1889.

It had been known for some time that every microörganism during its growth excreted substances, just as higher animals excrete certain substances every day, and that some microörganisms, such as those of anthrax, malignant edema, et cetera, excrete a chemical substance (ptomain, toxin, et cetera), which when injected into an animal will render that animal immune against an invasion of the specific organisms of that disease. PASTEUR was the first to point out that vaccination could probably be accomplished by use of these chemical substances, and thus opened a new field for original research.

By inoculating under the skin of a dog an emulsion of the spinal cord of a rabbit recently dead of rabies the microörganism of rabies and the chemical excrement of the microörganism are at the same time introduced. This chemical substance at once proceeds to destroy the microörganism and by the time the microörganism would naturally produce the disease the chemical substance has performed its work and has produced the immunity. If a small quantity of the rabic virus (emulsion) be introduced into an animal only a small quantity of organism and a small quantity of the vaccinating substance are introduced and the animal dies from rabies; but if 10 to 20 or 30 cubic centimetres of the emulsion be injected a large quantity of the organisms and at the same time a large quantity of the chemical vaccinating substance is introduced which overpowers the microorganism and prevents the disease from developing.

PASTEUR took fifty dogs and inoculated them in ten successive days, commencing with the weakest virus and each day using one of more strength until at the end of the treatment he could inoculate them with the strongest virus, even with the virus of a dog suffering with street rabies (*rage de la rue*). In this way he produced an immunity which lasted apparently for at least two years, and probably for a considerably longer time.

Thus PASTEUR had been able to protect animals from rabies, but he found his method for animals was not entirely applicable to man. However, PASTEUR was equal to the difficulty. It will be remembered the longer the cord was dried the fewer the microörganisms, but there was left a goodly quantity of their chemical excrement or vaccinating substance for his treatment of man. He made two injections each day, commencing with the cord of fourteen and thirteen days, on the second day with the emulsion of the cord of twelve and eleven days, the third day with the cord of ten and nine days, the fourth day the cord of eight and seven days drying, the fifth day only the cord of six days, and so on. This process finally came to be known as the "simple method."

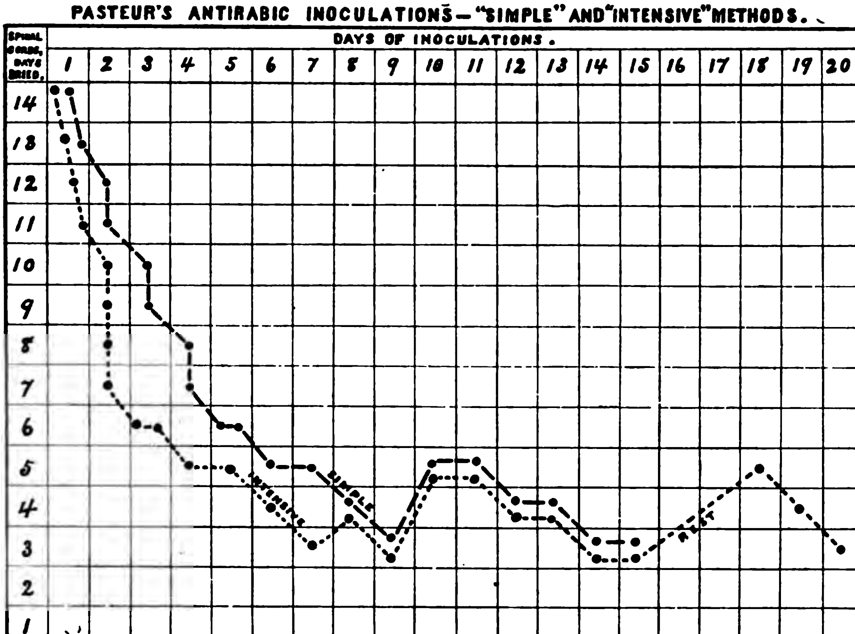
The simple method has been found sufficient in most cases; but, where the patient has been bitten badly on the face or head, a more intensive method has been found necessary, because in such cases the period of incubation is generally shorter and there is need for more active and vigorous measures, and thus the "intensive method" came to be used. Each injection consists of one-half cubic centimeter of the crushed cord in two cubic centimeters of sterilized beef tea. The patient is inoculated on the

1st	day	with	the	cord	of	14, 13, 12, 11	days	drying.	
2d	"	"	"	"	"	10, 9, 8, 7	"	"	
3d	"	"	"	"	"	6	"	"	(Two inoculations)
4th	"	"	"	"	"	5	"	"	
5th	"	"	"	"	"	5	"	"	
6th	"	"	"	"	"	4	"	"	
7th	"	"	"	"	"	3	"	"	
8th	"	"	"	"	"	4	"	"	
9th	"	"	"	"	"	3	"	"	
10th	"	"	"	"	"	5	"	"	
11th	"	"	"	"	"	5	"	"	
12th	"	"	"	"	"	4	"	"	
13th	"	"	"	"	"	4	"	"	
14th	"	"	"	"	"	3	"	"	
15th	"	"	"	"	"	3	"	"	

On the sixteenth and seventeenth days there is a rest, and on the eighteenth, nineteenth and twentieth days there is one inoculation each day with the cord of five, four and three days drying, respectively, which ends the treatment.

The following diagram will show at a glance the "simple" and "intensive" methods of treatment employed at the PASTEUR Institute:

PASTEUR'S ANTIRABIC INOCULATIONS—"SIMPLE" AND "INTENSIVE" METHODS.



Note—Each Dot represents one injection. Each injection consists of about one-half of a cubic centimeter of spinal cord crushed in two cubic centimeters of sterilized beef tea.

By means of the hypodermic needle subcutaneous injections are made into either side of the abdomen just above the crest of the ilium. Every precaution is taken that other complications—as abscess, syphilis, erysipelas, et cetera—are not spread from one patient to another. The injecting fluid is perfectly free from all pus-forming microörganisms, the needle is sterilized after each injection and in other ways asepsis is provided. DOCTOR RUFFER says he has seen many thousands of inoculations made and has yet to observe one instance of abscess resuting therefrom.

The personal inconveniences experienced during the antihydrophobic treatment are very slight. Following the example of a number of other directors and assistants connected with other PASTEUR institutes and for protection against a possible accidental inoculation while performing their every-day duties, DOCTOR PAUL GIBIER, director of the New York Institute, innoculated himself and two of his assistants. In a paper read before the New York County Medical Association, May, 1890, he gives in detail these interesting experiments. A brief mention of their experience may be of interest to the readers of this paper.

The treatment was according to the simple method. The injections of the first four days were followed by a slight irritation and redness at the site of the injection, and sleep was somewhat disturbed at night by a sensitiveness at the spot of inoculation. There was also a slight rise of temperature. These symptoms remained during the first ten days of the treatment; then the tissues seemed to have accustomed themselves to the injections and the above-mentioned symptoms decreased in severity and three days after the last inoculation there remained hardly a trace of the injections. GIBIER said there was unusual activity of his salivary glands, and several times each day he was obliged to eject; that during the last week of the treatment and the week following he had a certain heaviness of his head and felt unable to work. The same symptoms, with the following additional ones, were experienced by his assistants: after inoculation with marrow of the sixth day, one assistant complained of sudden pain in his right side lasting about one hour, and at times during the last week of the treatment suffered neuralgic pains in different parts of his body, and dizziness which rendered walking difficult; during most of the treatment the other assistant suffered more or less severe local and general pains. These symptoms continued for about fifteen days after the treatment, accompanied by unusual sexual excitement, sadness, undefined preoccupation and neuralgic pains. About fifteen days after the last inoculation each assistant experienced pain in the spots where the injections were made.

DOCTOR KRAIOUCHKINE, of the Saint Petersburg Institute, says he has noticed during the treatment almost no general reaction on the organism, but, with the exception of very rare cases, he has observed lassitude, or fatigue, accompanied with headache and sleepiness but without elevation of temperature. Very often there is a local reaction of the pricked spot, redness, swelling, edema and hardening, but a little cold cream and rice powder makes it disappear rapidly. This local reaction produces principally on the individual a very thick cutaneous tissue, but abscesses have never formed.

DOCTOR ULLMANN and his four assistants also took the treatment to insure against accidental inoculations.

PASTEURISM, AND ITS RESULTS.

SINCE the establishment of the Paris PASTEUR Institute for the preventive treatment of hydrophobia, many institutes and laboratories have made preparations to give the treatment, until to-day such institutions are so numerous, and conveniently located as to be accessible to all. To my knowledge they are now located in Paris, Saint Petersburg, Odessa, Vienna, Moscow, Constantinople, Milan, Naples, Lisbon, Barcelona, Bucharest, Cochin China (at Sagon), Mexico, Havana, Tunis, Padua, Kharkof, Budapesth, Stamboul (Turkey), Buenos Ayres, Rio de Janerio, Turin, Calcutta and, last but not least, in New York and Chicago.

Early in the year effort was made toward the establishment of a PASTEUR Institute at Simla, India, not only for antihydrophobia inoculations but for the systematic and specialized investigations into the causation and prevention of various diseases. The movement has been received with much favor. Donations, government grants and subscriptions from individuals and municipalities have been made, and the government has promised the services of a capable medical official. It is probable that the institute is now in working order.

In April of this year the British Institute for Preventive Medicine made application to erect a PASTEUR Institute at Chelsea, England. There was some objection by the residents of Chelsea, claiming that it would not only depreciate the adjoining property, but would be a possible source of infection. The institute has been commenced and although the building proper is not yet completed work is being pursued.

It is announced that antihydrophobia stations are soon to be established in various cities of Turkey, among which are especially mentioned Yemen, Bagdad, Damascus, Erzeroum, and Monastir.

In Paris—M. Pasteur, Director.

Since JOSEPH MEISTER was treated antihydrophobically many thousands of people have undergone the inoculations at the Paris PASTEUR Institute. The following table will give you the results during the years 1886—1893:

Years.	Persons treated.	Deaths.	Death-rate per cent.
1886	2,571	25	0.94
1887	1,770	14	0.79
1888	1,622	9	0.55
1889	1,830	7	0.38
1890	1,540	5	0.32
1891	1,559	4	0.25
1892	1,790	4	0.22
1893	1,648	4	0.24
Total	14,330	72	0.50

PASTEUR has established a custom of dividing the cases into three classes, namely:

(A) Those bitten by animals proved to be rabid, by laboratory experiments, or by the death of other persons or animals bitten by the same animal.

(B) Those bitten by animals recognized by clinical or veterinary examination to be rabid; and

(C) Those bitten by animals supposed to have been rabid.

These rules have been generally followed out in the statistical results of PASTEUR Institutes.

Years.	A			B			C		
	Number treated.	Died.	Mortality per cent.	Number treated.	Died.	Mortality per cent.	Number treated.	Died.	Mortality per cent.
1886	223	5	2.15	1,931	24	1.24	518	7	1.35
1887	357	2	0.56	1,161	15	1.29	260	4	1.54
1888	403	7	1.74	974	4	0.41	248	1	0.40
1889	348	4	1.15	1,188	9	0.25	298	3	1.00
1890	385	0	0	960	3	0.95	223	0	0
1891	313	0	0	967	7	0.72	313	2	0.64
1892	139	1	0.72	1,052	3	0.29	609	2	0.33
1893	111	0	0	937	7	0.75	497	2	0.40
	2,279	19	....	9,170	72	....	2,966	21	....

Of the 1,648 treated during 1893, 178 came from places outside of France; 43 from Spain; 35 from Greece; 23 from England; 22 from Belgium; 18 from Egypt; 14 from British India; 9 from Switzerland; 9 from Holland; 6 from Portugal; Germany and Turkey, 2 each; and Austria, United States, Brazil, Russia and Morocco, one each.

Since the foundation of the institute, no fewer than 14,330 have been treated by the PASTEUR method in Paris. Of these 1,213 (16 fatal cases) were bitten on the head, 8,032 (45 fatal cases) on the hands, and 5,185 (11 fatal cases) on the limbs.

In August, 1884, in the absence of M. PASTEUR, DOCTOR ROUX replying to an inquiry, stated that nothing had yet been done in preventing the development of hydrophobia in human beings infected with the disease. Contrast this statement of DOCTOR ROUX with a statement that he would have been able to make at the close of the year 1893, when 14,330 persons have been treated with a mortality of only 0.50 per cent.

The statistics of the Paris Institute show that the majority of cases of hydrophobia occur between the months of February and May.

At Turin, Italy.

During the period from September 30, 1886, to September 30, 1893, there have been treated a total of 1,738 persons, with 8 deaths, or a mortality of .46 per cent.

At New York—Doctor Paul Gibier, Director.

Statistics of the Preventive Treatment against Hydrophobia since its opening—from February 18, 1890, to January 1, 1895 (nearly four years):

	A*			B*			C*		
Bites inflicted on the head and on the face — simple	----	7	18	----	6	9	----	17	33
Bites inflicted on the head and on the face — multiple	5	11		----	3		----	16	
Cauterization — *efficacious*	----	----	----	----	----	----	----	----	----
Cauterization — *non-efficacious*	7	----	----	----	----	----	9	----	----
No cauterization	11	----	----	9	----	----	24	----	----
Bites inflicted on the hands — simple	----	64	113	----	58	100	----	63	113
Bites inflicted on the hands — multiple	----	49		----	42		----	50	
Cauterization — *efficacious*	2	----	----	1	----	----	1	----	----
Cauterization — *non-efficacious*	49	----	----	40	----	----	47	----	----
No cauterization	61	----	----	59	----	----	65	----	----
Bites inflicted on the limbs and on the body — simple	----	21	44	----	23	38	----	50	69
Bites inflicted on the limbs and on the body — multiple	----	23		----	15		----	19	
Cauterization — *efficacious*	----	----	----	1	----	----	3	----	----
Cauterization — *non-efficacious*	28	----	----	15	----	----	30	----	----
No cauterization	16	----	----	23	----	----	36	----	----
Clothes torn	11	----	----	14	----	----	5	----	----
Bites inflicted on bare parts	3	1	1	9	----	----	6	5	5
Bites inflicted on different parts or the body	----	----	12	----	----	10	----	----	11
Cauterization — *efficacious*	1	----	----	----	----	----	1	----	----
Cauterization — *non-efficacious*	4	----	----	4	----	----	8	----	----
No cauterization	8	----	----	6	----	----	7	----	----
Clothes torn	1	----	----	1	----	----	4	----	----
Bites inflicted on bare parts	9	----	----	4	----	----	9	----	----
	----	----	188	----	----	157	----	----	231
				576					

* The column A refers to persons bitten by animals in which hydrophobia has been evidenced by experimentation or by the death of some other persons or animals bitten by them; column B to persons who have been wounded by animals having been recognised rabid by the clinical or veterinary examination; and column C to cases in which hydrophobia could only be suspected, as the animals had disappeared or were killed instantly and their bodies thrown away.

Of the 576 persons treated during the period from February 18, 1890, to January 1, 1895, there were only four deaths, or a mortality of 0.67 per cent. In *The New York Therapeutic Gazette*, for September, 1894, Doctor Gibier exhibits some very interesting tables. One table shows that 40 persons who were bitten by dogs which bit and caused the death of other animals, were treated successfully. Another table shows where 24 persons who were bitten by dogs whose bite caused the death by hydrophobia of some other persons, were treated successfully. In one of these cases four men, in another three men and a child, in a third a woman and a child and in the rest of these cases one person, all subsequently died of hydrophobia.

Of the 85 persons treated in 1893, 26 were bitten by animals proved to be rabid, 11 by animals recognized by clinical or veterinary examination to be rabid, the remaining 48 were bitten by animals suspected of rage.

At Odessa, Russia—Doctor Buivid, Director.

During the year 1890 there were treated at Odessa 727 persons (443 males and 284 females). Among this number 257 were children of 10 years or under.

In 649 cases the animal causing the bite was a dog, in 43 a cat, in 6 a horse, in 4 a wolf, in 3 an ox, and in 3 a pig.

In 201 cases the animal causing the bite was proved experimentally to be rabid, in 10 by death of other animals bitten at the same time, in 261 by post mortem examination, in 251 by symptons evinced by the animal, and in 4 it was uncertain.

In 120 cases the wounds were severe and on uncovered parts of the body, in 485 moderately severe, in 103 slight (having been inflicted on the limbs through thick clothing).

In 524 cases the persons presented themselves for treatment within a week after the bite, in 122 cases within two weeks, in 44 within three weeks, in 14 within four weeks, and in 4 a month or more after the bite.

Classified by months of the year, they were as follows:

Months.	Persons bitten.	Months.	Persons bitten.
January	34	July	117
February	40	August	91
March	59	September	40
April	84	October	43
May	76	November	35
June	82	December	31
Total			732

The duration of treatment was in the majority of the cases three weeks. The total number of persons who underwent the complete treatment was 704, with 9 deaths, or a mortality of 0.71 per cent.; of these 4 died during the treatment, and 5 after its completion.

At the Odessa Bacteriological Station, during the year 1893, there were treated 793 persons. Of those who had passed through the treatment, and could be said to have died in spite of the preventive inoculations, there were two deaths or a mortality of only 0.26 per cent. However, 4 of the 793 delayed in commencing the inoculations, and died during the treatment and should not be included in the deaths. If these four were included the number of deaths would have been 6, and the mortality would have been 0.76 per cent. Of the 793 persons admitted for treatment, 83 were bitten by animals proved experimentally to be rabid; 253 by animals pronounced rabid after veterinary or post-mortem examination; 439 were bitten by animals suspected of rage; and 18 were persons who had been subject to the danger of contagion while attending sick persons or animals.

Classifying these persons according to age, 96 were under five years of age, 161 from 5 to 10, 211 from 10 to 20, 231 from 20 to 40, 74 from 40 to 60, and 20 were over 60 years of age.

In 5 cases the animal causing the bite was a wolf.
In 710 " " " " " " " " dog.
In 56 " " " " " " " " cat.
In 2 " " " " " " " " calf.
In 1 " " " " " " " " pig.
In 1 " " " " " " " " horse.
In 18 cases there was possibility of infection while tending sick persons or animals.

At Budapesth, Hungary—Professor Högyes, Director.

From April 15, 1890, to April 14, 1891, the number of persons subjected to the protective inoculations was 701, of whom 8 died of hydrophobia, giving a mortality rate of 1.14 per cent.

From April 15, 1891, to April 14, 1892, there were treated 540, of whom 3 died, giving a mortality of 0.58 per cent. The average mortality for the first two years (April 15, 1890, to April 14, 1892) was 0.88 per cent. Of the 1,241 persons treated 130 had been bitten on the head, face or neck, of these 3, or 2.30 per cent. died; of 486 bitten on the hands 7, or 1.64 per cent. died, and of 625 bitten on the foot or on the trunk, only 1, or 0.16 per cent. died.

Official statistics of the Hungarian Government show that of those who were bitten during these two years, who either did not apply for treatment, or applied too late for successful treatment, the mortality was 26.8 per cent. When this mortality rate is compared with the rate among those treated in time, the difference bears striking testimony to the efficacy of the protective inoculations.

During the year ending April 14, 1893, there were 641 persons treated, with six deaths or a mortality of 0.93 per cent. during the third year of the Institute. In the second year the mortality was 1.16, and in the first it was 0.56. During the three years ending April 14, 1893, there were 1,350 persons treated with 13 deaths, or a mortality of 0.91 per cent. Experience showed that the largest number of cases occurred in June, July, and August, and the least in November. The total number of persons who died of hydrophobia in all Hungary during the same period was 103.

At Moscow, Russia—Doctor Goldenbach, Director.

The statistics for the year 1892 show that 907 persons were treated, of whom 613 were males, and 294 females. Of the 907 treated, 178 were bitten by animals proved to be rabid, 439 by animals pronounced rabid after veterinary or post-mortem examination, 290 by animals probably rabid.

In 769 cases the animal causing the bite was a dog.
In 45 " " " " " " " " wolf.
In 70 " " " " " " " " cat.
In 11 " " " " " " " " horse.
In 8 " " " " " " " " cow.
In 2 " " " " " " " " pig.
In 2 cases the bite was caused by a human being.

Of the 907 treated, 6 died notwithstanding the treatment, giving a mortality of 0.66 per cent.

From June 25, 1886, to June 25, 1892, there have been inoculated a total of 3,961 persons.

At Rio De Janerio, Brazil—Doctor Agusto Dos Santos, Director.

From the opening of the institute (February 9, 1888) to June 30, 1892, 1,149 persons presented themselves for treatment, but of this number 473 persons were for various reasons rejected. Of the remaining 676 there were 511 males and 165 females; 105 were treated in 1888, 90 in 1889, 158 in 1890, 242 in 1891, and 81 in 1892.

In 505 cases the bites were inflicted on uncovered parts of the body, and in 171 on covered parts of the body, but the animal's teeth had penetrated the clothing.

Cauterization was performed effectually in 34 cases, ineffectually in 392, and there was no cauterization in 250 cases.

The animal causing the bite in 613 cases was a dog, in 52 a cat, in 2 a mule, and in 1 a horse. In the remaining number the treatment was applied because of probable accidental infection while attending the sick persons or animals.

In six cases the bite was on the head, in 236 on the hands, in 131 on the arms, in 201 on the legs, and in 29 on the trunk. In ten cases the patient had been bitten on different parts of the body.

In 80 cases the animal causing the bite was proved experimentally to be rabid, in 287 the animal was recognized rabid because of its symptoms, and in 300 cases the symptoms of the animal were so suspicious as to make it probable that the animal was rabid.

Of the total (676) commencing the inoculations, 15 for various reasons discontinued the treatment, leaving 661 who completed it. Of these 661 only 7 died, giving a mortality of 1.05 per cent.

During the period between February 9, 1888, and August 14, 1889, there were 150 persons treated. Of this number 141 were bitten by dogs and 15 by cats. In 19 cases the animal causing the bite was found to be mad, in 67 cases the animal was recognized by clinical or veterinary examination to be mad and in 70 cases the animal was supposed to be mad.

From February 9, 1888, to May 19, 1894, there were treated 1,147 persons, with only 9 deaths, or a mortality of 0.78 per cent.

At Saigon, Cochin China—Doctor Calmette, Director.

From April 15, 1891, to May 1, 1892 (first year of the institute), 48 persons were treated. In 16 of these cases the animal was proved to be rabid, and in all other cases confirmation of the virulence of the bite was received before treatment was commenced. Of the number treated during this period, 16 presented themselves on the fifth day after being bitten, 4 from the tenth to the twentieth, 6 from the twentieth to the thirtieth, and 1 on the fortieth day. In spite of the long delay before commencing treatment, only one patient died. In all cases the "intensive method" was used.

Between May 1, 1893, and May 1, 1894, there were 49 treated, with two deaths, one of these deaths occurred immediately after the completion of the treatment.

At this institute the natives are treated at the public expense, and every native bitten by an animal known to be rabid or strongly suspected of rabies, is immediately sent for treatment.

During the twelve months ending May 1, 1893 (second year), there were 62 persons treated, with 1 death, or a mortality of 1.61 per cent. In 12 cases the animal causing the bite was proved, experimentally, to be rabid, and in the other 50 cases the diagnosis was made clinically on the statements of veterinarians, and, in some cases, on the statement of civil or military officials. The dog was the cause of the bite in all instances except one, when the biter was a man suffering from hydrophobia.

Since the establishment of the institute (April 15, 1891) to May 1, 1893, there were 110 persons treated, with two deaths, or a mortality of 1.81 per cent.

At Padua, Italy—Doctor Giovanni, Director.

During the last seven months of 1890, Doctor Giovanni had treated 49 persons with no deaths. Twenty-three of these were bitten by animals proved experimentally to be rabid, 18 by animals recognized by clinical or veterinary examination to be rabid, and in the remaining 8 by animals in which rage was only suspected. In all the patients the bite had drawn blood, and in nearly all the wound was on an exposed part of the body, in 30 cases the bite was on the upper limbs, and in 2 the bite was on the head. Three months after the last treatment in 1890 all patients were reported healthy.

In the year 1891 there were 57 persons treated, and in 1892 there were 48. No death occurred in either year.

At Buenos Aires, Argentine Republic—Doctor D. J. Davel, Director.

The institute at Buenos Ayres was the first of its kind in North or South America, and the fifth in the entire world. The first inoculations were made September 4, 1886, in the presence of a distinguished assembly, composed mostly of medical men and students. From September 4, 1886, to September 6, 1894, there were 1,981 cases treated, with 14 deaths, or a mortality of 0.70 per cent. The following are the facts for the several years:

Years.	Number treated.	Deaths.	Death-rate per cent.
1886	19*	0	.00
1887	77	1	1.29
1888	236	1	.42
1889	259	5	1.93
1890	254	3	1.18
1891	285	1	1.35
1892	313	0	.00
1893	327	2	.61
1894	211†	1	.47
Total	1,981	14	0.70

* From September 4 to December 31, 1886.
† From January 1 to September 6, 1894.

Of the 14 fatal cases one person sought treatment 36 days after receiving the bite, several delayed 26 days, one 12 days; and, considering these long delays, the great fatality cannot be attributed to the inefficiency of the method of treatment. Again, in some of the 14 cases death was not produced exclusively by rabies, but other serious complications, and the gravity of the bite, were causative factors.

In 683 cases the animal causing the bite was proved, experimentally, to be rabid; and of these only 4 died. It is estimated that thirty per cent. of these 683, or 204 persons, would have died had they not presented themselves for the treatment. Of the total number treated (1,981) there would have resulted, at the same ratio, 594 deaths.

Of the 825 persons treated during the period between September, 1886, to December 31, 1890, the mortality among those bitten by animals proved, experimentally, to be rabid was 2.74 per cent., among those in which the animals were recognized by veterinarians to be rabid 0.85 per cent., and among those bitten by animals suspected of rage it was 0.59 per cent.

At Bucharest—Professor Babes, Director.

At the meeting of the International Medical Congress in Berlin (1890) BABES reported that in the PASTEUR Institute at Bucharest about three hundred persons are inoculated yearly, with a mortality of about 0.40 per cent. in cases bitten by dogs, most of which were demonstrated to be rabid by inoculation experiments made at the institute.

At Naples—Doctor Calabrese, Director.

From August, 1886, to April, 1894, there were inoculated 1,000 persons. Of this number 291 were bitten by animals proved to be rabid, 486 by animals recognized by clinical or veterinary examination to have been rabid, the remaining 223 were bitten by animals only suspected of rage. The number of deaths was 8, or a mortality of 0.80 per cent.

At Havana, Cuba (Bacteriological Laboratory)—Doctor Acosta, Director.

This is reported to have been the first place in the tropics where the PASTEUR method was tried. From April 15, 1887, to December 31, 1889, there were 306 persons treated, with two deaths, or a mortality of 0.65 per cent. In the first 105 persons treated no deaths resulted, although they had been bitten by dogs proved experimentally or clinically to have been mad. Notwithstanding some 700 persons applied for treatment during this period, only the 306 were accepted.

At Saint Petersburg—Doctor M. W. Kraiouchkine, Director.

This antirabic station was established July 13, 1886, and was a gift of his Highness, PRINCE ALEXANDRE PETROVITCH D'OLDENBOURG, and was first installed at the Veterinary Infirmary of the Regiment of Horse Guards, but was in 1892 transferred to the Imperial Institute of Experimental Medicine, which institute was also founded by his Highness.

During the five years ending July 13, 1891, 1,256 persons presented themselves for treatment. Of this number 394 were rejected for various reasons and 23 discontinued the treatment, leaving 839 who completed the treatment.

The following table shows, by years, the number treated during the five years ending July 13, 1891:

Years.	Persons treated.
1886 (last six months)	137
1887	200
1888	184
1889	106
1890	142
1891 (first six months)	70
Total	839

Of the 839 persons treated there were 391 men, 192 women, and 256 children (under fifteen years of age).

The largest number of persons were bitten during the months of June, July and August. This may, however, be due to the fact that the peasants were the class of people most commonly bitten and the summer months is the season of the year when they pass most of their time in the fields. The following table will classify the bites, by months of the year:

Months.	Persons bitten.	Months.	Persons bitten.
January	66	July	116
February	74	August	88
March	62	September	73
April	68	October	63
May	45	November	56
June	92	December	36
Total			839

The majority of persons bitten presented themselves within one week after being bitten; and, as this is an important factor in the success of the inoculations, the following table is presented:

Those presenting themselves within 3 days after the bite,	213
" " " " 1 week " " "	281
" " " " 2 weeks " " "	213
" " " " 3 " " " "	80
" " " " 4 " " " "	37
" " " later than 1 month " " "	15
Total,	839

In 735 cases the animal causing the bite was a dog.
In 75 " " " " " " " " cat.
In 16 " " " " " " " " wolf.
In 4 " " " " " " " " horse.
In 3 " " " " " " " " cow.
In 6 " " " " " " " " fox.

839

Of the 839 treated, 222 were bitten on covered parts, and the remaining 617 are divided as follows:

Those bitten on the head	54
" " " " superior members	487
" " " " inferior "	33
" " " different parts of the body	43
	617

In 422 cases the animal causing the bite was proved to be rabid, and the mortality was 3.08 per cent.; in 240 cases the animal was recognized by clinical or veterinary examination to be rabid, and the mortality was 1.25 per cent.; and in 177 cases where the animal could only be suspected of rage, the mortality was 3.38 per cent. The general mortality was 2.62 per cent.

The largest number of deaths occurred among those patients presenting multiple bites on the head or other parts of the body. No deaths occurred in the 222 cases where the bite was on covered parts; but, in the 617 cases where the bite was on uncovered parts, there were 22 deaths or a mortality of 3.56 per cent.

In the year 1892 there were 288 persons presented for treatment. Of this number 66 were rejected for various reasons, and 11 discontinued the treatment, thus leaving 211 persons who completed the inoculations. Of this number 109 were men, 43 women, and 59 children (under 15 years of age).

The following table classifies the bites by months of the year:

Months.	Persons bitten.	Months.	Persons bitten.
January	18	July	15
February	9	August	22
March	13	September	21
April	28	October	15
May	19	November	7
June	22	December	6
Total			195

Those presenting themselves within 3 days after the bite,	25
" " " " 1 week " " "	71
" " " " 2 weeks " " "	63
" " " " 3 " " " "	29
" " " " 4 " " " "	14
" " " later than 1 month " " "	9
Total	211

In 181 cases the animal causing the bite was a dog.
In 17 " " " " " " " " cat.
In 8 " " " " " " " " wolf.
In 3 " " " " " " " " horse.
In 1 " " " " " " " " guinea pig } experimental
In 1 " " " " " " " " mouse } animals.

Of the 211 persons treated, 68 were bitten on covered parts, no death occurring. The remaining 143 were bitten as follows:

Those bitten on the head	16
" " " superior members	108
" " " inferior "	11
" " " different parts of the body	8
	143

Of the 211 persons treated during the year 1892, three died, giving a mortality of 1.42 per cent.

At Vienna—Professor Paltauf, Director.

Antihydrophobia inoculations are being given at the Rudolph Stiftung Hospital at Vienna. The inoculations are performed daily between 10 and 11 A. M. At present there is no charge for the treatment, but it is understood that the charge for such treatment is now under consideration.

Preventive inoculations have been given by DOCTOR ULLMANN. In one year 122 persons were treated, within 10 days after the bite, and only 3 died, or a mortality of 2.46 per cent. During the same period several others were bitten by the same dog causing the bite of some of the 122 treated. These persons did not undergo the treatment and have since died.

At Chicago—Doctor A. Lagorio, Director.

During the period between July 2, 1890, and February 9, 1894, 366 persons were treated, and are classified as follows:

Of the total number treated 104 were bitten by animals recognized to be rabid by experimental proof, or by death of other persons or animals bitten by the same animal; 126 were bitten by animals recognized to be rabid by the symptoms of the disease; and 72 were bitten by animals strongly suspected of rabies.

Dogs caused the bite in 341 cases, horses in 9, cats in 7, skunks in 5, wolves in 2, a mule in 1 case, and a pig in 1 case.

Two deaths were reported among the above mentioned patients, giving a mortality of only 0.54 per cent.

In 123 of the cases the animal causing the bite was proved to be rabid, in 160 the animal was recognized to be rabid by the symptoms of the disease shown during life, and in 83 cases the animal causing the bite was strongly suspected of rabies.

Besides the 366 persons who were treated, 372 others were rejected for various reasons.

[DOCTOR LAGORIO records the case of a five-year-old boy, subject to epilepsy, who, on account of the bite of a dog, was treated at the laboratory in August, 1890, and who has not only never suffered bad consequence from the bite, but recovered from the epilepsy as well. Similar cases and results have been noticed at other institutes, although I believe that DOCTOR LAGORIO claims priority].

At Calcutta, Bengal—A. Reuter, Director.

A PASTEUR Institute was successfully inaugurated on January 30, 1894, in the presence of a large company. After the ceremony subscriptions to a considerable amount were promised.

At Milan, Italy—Doctor Remo Segrè, Director.

This institute was established in 1890, by subscription from local business houses. During the years 1890 and 1891, 238 cases were treated. Of these 108 were bitten by animals proved experimentally to be rabid (two deaths), 121 by animals recognized by medical men or veterinary surgeons to have been rabid (two deaths), and 9 were bitten by animals suspected of rage (no death). Thus out of 238 treated there occurred 4 deaths, or a mortality of 1.68 per cent.

At Constantinople, Turkey—Doctor Zoeros, Director.

Between May 1, 1887, and March 1, 1889, 41 persons were treated, with no death resulting. Of these 12 had been bitten by animals proved experimentally to be rabid, 26 by animals recognized rabid by medical men, veterinary surgeons, or other competent persons, and 3 by animals in which rabies was only suspected.

Value of the Dog.

That there is about one dog to every fourth family, and many more dogs than is absolutely necessary, is a fact recognized by nearly every citizen in the United States and probably by the great majority of people in the world; however, that species of animal is still being propagated, until to-day an important question is "What is to be done with the dog?"

Recognizing the fact that probably nine-tenths of all the cases of hydrophobia are due to the bite of the dog, many ways to prevent the occurrence of rabies have been suggested. One will advocate the muzzling of all dogs, and another will recommend the extermination of that animal. Preventive inoculation of every dog has been suggested; but, as this has not been generally tried, it does not at present seem entirely practicable.

Muzzling is effective when fully enforced, but experience has shown that it is difficult to keep muzzled every dog. It is stated, however, that in Germany where muzzling is generally enforced there are very few cases of hydrophobia.

In cities the system of "catching and killing" stray dogs has proved efficacious indeed and every year there are thousands of stray dogs caught and, if not claimed within a certain period, they are killed by various methods, such as drowning, smothering in a vacuum chamber, killing by poisonous gasses, et cetera. This seems cruel, but something must be done to rid the country of the over-numerous dogs.

While the protection of human beings is of primary importance, there is still another consideration of no slight importance, namely, the destruction of property. It is not uncommon to have it reported that a mad dog has killed or given rabies to such valuable property as horses, cows, sheep, chickens, et cetera, which usually means death to the animals infected. While there are many instances of destruction of stock, the most notable I now have in mind is the outbreak of rabies near Fowlerville, Michigan, in March, 1888. It is reported that one dog caused the death of some six cows, nine horses, and about seventy-five chickens. The dog also attacked two children; but, as the bite was on parts thoroughly covered and there was no abrasion of the skin, the children did not have hydrophobia. Nearly all of the mentioned animals died of rabies. It is of common

occurrence to hear of outbreaks of rabies of more or less magnitude occurring in different parts of the world. In fact they are so frequent that it would be useless to try to enumerate them; medical journals and statistics abound with them.

The following table will give a vivid idea of the enormous money-loss by dogs in the state of Ohio for the years 1880–1893. Through the kindness of the Secretary of State's office at Columbus, I have been able to secure, and have tabulated the following facts:

NUMBER AND VALUE OF SHEEP KILLED AND INJURED BY DOGS, IN OHIO, FOURTEEN YEARS, 1880-93; AND NUMBER OF MILCH COWS COMPARED WITH NUMBER OF DOGS, IN OHIO, FOURTEEN YEARS, 1880-93.

Year.	Sheep killed by dogs.		Sheep injured by dogs.		Total No. of milch cows.	Total No. of dogs.
	No. of sheep.	Value of sheep.	No. of sheep.	Value of sheep.		
1880	28,763	$97,277	23,625	$41,671	*	121,656
1881	33,297	122,684	31,609	60,394	*	*
1882	34,606	133,765	31,422	58,748	556,425	*
1883	32,955	122,788	24,814	51,188	556,425	214,794
1884	30,327	104,622	21,685	43,256	576,147	160,072
1885	21,146	85,590	18,807	33,039	579,990	160,018
1886	29,006	82,183	19,484	35,098	595,524	168,398
1887	19,029	84,701	18,283	51,490	580,538	162,809
1888	31,836	107,749	25,296	44,264	610,477	162,644
1889	32,080	103,531	26,152	48,503	619,483	155,446
1890	27,862	100,536	21,823	42,857	595,133	148,409
1191	25,057	94,965	17,705	40,464	613,507	153,892
1892	28,469	107,181	22,040	44,509	612,766	158,142
1893	29,915	107,431	22,840	46,893	600,463	152,764
	403,348	$1,456,003	325,585	$642,374		

* No statistics reported to the Secretary of State.

The Agricultural Statistics of Ohio for the last ten years show that on an average every year there are about 600,000 milch cows and about 150,000 dogs existing in the state, or about one dog to every four cows. These facts plainly show the prevalence of the dog. The dog is probably as numerous in other states. Considering the comparative value of the two animals, it does not seem possible that the citizens of any state will keep an animal which is of so little value, and no small expense, as the average dog. Every one knows the value of a milch cow, but there are people who rather part with a whole herd of milch cows than to part with their pet dog even though the dog be the worst kind of a mongrel.

From the foregoing table it will be observed that in the state of Ohio *alone*, during the fourteen years (1880–1893) 404,348 sheep were killed and 325,585 were injured, giving an appalling money-loss of $2,098,377. Supposing such a statement were made for the whole world, and the loss of human life should be included, would not the facts be a powerful argument for *less dog*, less sacrifice of property and less sacrifice of human life?

To counterbalance the immense loss of property and human life every year there is provided in many cities and countries a dog-tax or license which is a revenue to the local funds amounting to millions of dollars. In Chicago the dog-tax without regard to the sex of the animal is two dollars per year, the number of licenses issued each year averaging from 34,000 to 35,000, which means that in Chicago alone there is turned into the city treasury a sum averaging about $75,000 yearly.

Of course the number licensed does not cover all the dogs, because they are "caught and killed," and many are never licensed. I presume a conservative estimate would be that in cities where there is an effective dog ordinance about three-fourths of the dogs are licensed; while in smaller towns and cities about one-tenth would be a fair estimate of the number licensed.

In Detroit the ordinance provides a license of $1.00 for male and $2.00 for female dogs, with an additional ten cents each for the tag. During the four years, 1890–93, there were 8,507 licenses issued with a revenue to the city of $9,574.70. But as Detroit claimed about 250,000 citizens, there ought to have been in the four years at least 75,000 dogs licensed, with a revenue of at least $100,000 instead of only $9,574.70. It is evident the dog ordinance is not being rigidly enforced.

I am informed that there is no law or ordinance in Philadelphia compelling dogs to be registered or providing for a dog-tax. There is, however, an ordinance requiring all dogs running at large to be muzzled, and if any are found unmuzzled, they are taken up by the "dog catchers" and turned over to the pound-master where they may be redeemed by paying $2.00 If not redeemed they are killed by some kind of gas. In 1891 there were 6,052 dogs captured, and 4,829 were killed; the redemption money paid to the city was $2,128. By paying $1.25 at the office of the Clerk of Quarter Sessions, the owner may receive a life-long registration certificate for his dog which makes the animal the personal property of the owner. This certificate may be transferred by paying the sum of 12 cents. From September, 1860, to November 22, 1894, about 8,519 dogs where registered becoming the personal property of the owner.

In Bavaria from 1863 to 1876 the deaths from hydrophobia ranged from 14 to 31 each year. A striking contrast are the statistics for the first seven years (1893–1889) of the enforcement of the muzzling order which provides for the killing of stray dogs. During this period of enforcement of the order, only three deaths have occurred in a population of five and one-half millions of people.

During the month of August, 1889, the police in London seized 3,290 stray dogs; 47 either rabid or supposed to be were killed on the streets; 19 were proved by post-mortem examination to be rabid; and 1,681 persons were reported to have been bitten by dogs. In May, 1894, the London police captured 2,161 stray dogs, and 148 persons were reported to have been bitten by vicious dogs.

There are reported to be 150,716 dogs in the Seine Department, France. In 1892 the municipal tax was collected from the owners of 130,716 dogs, and in 20,000 the tax was avoided.

A vicious dog may cause his owner a considerable expense as well as trouble. A dog that destroys property may be an expensive pet. In France only a few years ago a man was bitten by a vicious dog from which he received a permanent injury. He instituted an action for damages and

the courts awarded him a judgment of 11,000 francs (about $2,500) and ruled that the owner of a dog was responsible for any damages done by the animal.

The dog, and especially the house dog, may be a source of contagium in infectious diseases. The Iowa State Board of Health has recently (September, 1894) reported a death from diphtheria in which the source of infection was traced to a pet dog. DOCTOR STILES, of the Bureau of Animal Industry tells how animal parasites dangerous to man, such as the tongue-worm (*Linguatula rhinaria*) the tape-worm (*Tenia echinococcus*), et cetera, are conveyed to man by way of the pet dog.

RULES AND REGULATIONS SHOULD BE FRAMED AND PUBLISHED.

One of the most efficient means employed for the restriction of the spread of rabies is a set of rules which shall regulate the action and movements of animals infected with the disease. Each local board of health should frame and publish (in accordance with state laws) rules which would enable the health officer to act promptly upon the appearance of a case of this disease so dangerous to the public health and life. If a health officer is obliged to wait until the local board can be called together, the disease may have been allowed to spread, instead of restricting it to the first case.

On the occurrence of a case of rabies the facts should be reported to the local health officer, and promptly restricted by him in accordance with Act 137, Laws of 1883. The health officer should, in compliance with Sections 5 and 6, Act 125, Laws of 1889, report the fact to the president of the State Live Stock Commission, who at present resides at Stanton, Michigan. The local health authorities should isolate the animal or animals and keep them so, until they are taken care of by the State Live Stock Commission or State Veterinarian; but, under no circumstance should the local health authorities fail to guard the public health and life. Whether in man or animals the full facts regarding the outbreak of the disease should be reported to the Secretary of the State Board of Health, at Lansing.

In cities the "Dog Ordinance" generally regulates the action of animals most likely to be infected with rabies. Every city should be equipped with an efficient ordinance and should demand its strict enforcement. An ordinance may be ever so efficient, but if not enforced is useless, and the stray and ownerless dogs will be permitted to roam about the city to become infected with rabies and transmit the disease to human beings. The following is an ordinance in force in a certain city of the U. S. which it seems to me no city would make a mistake by copying:

Be it ordained by the City Council of the City of ....:

SECTION 1.—Every owner of, or person who harbors or keeps, a dog within the limits of this city, shall report to the City Collector annually, within thirty days after the first day of May in each year, his or her name and address, and shall give the name, breed, color and sex of each and every dog owned or kept by such person, and shall pay to such officer the sum of two dollars for each and every dog, and cause such dog, or dogs, to be registered for license in the office of the City Clerk, who shall furnish the owner or keeper of same with a license tag.

SECTION 2.—Every dog shall be provided by its owner or keeper, with a leather or chain collar, to which a license tag shall be securely fastened, and every dog shall also be muzzled, if so ordered, as hereinafter provided. No dog shall be permitted to remain within the limits of the City of ...., unless the owner, or keeper thereof, shall have caused such dog to be registered and licensed, and provided with such collar and tag, and be muzzled, if so ordered, and any owner, or keeper, of a dog failing to provide

such collar, tag or muzzle, if required, shall be subject to a fine of five dollars for every such dog so unprovided, to which fine shall be added, if unlicensed, the amount of the license tax, and costs, if any, incurred.

SECTION 3.—The City Clerk shall keep a complete registry, in a book to be kept for that purpose, of all licensed dogs, describing same by name, breed, color and sex, and shall also enter the name and address of the owner or keeper as given, and the number of the city license tag.

He shall provide, each and every year, such number of metal tags as may be necessary (the shape to be changed each year) having stamped thereon the year for which the tax is paid, the letters ..... D. T., and also the number of the tag, and it shall be the duty of the City Clerk to deliver one of such metal tags, number to correspond with the number of the registry of the dog, to the person having paid the tax upon any such dog.

The City Clerk shall also send a duplicate of such registry to the Pound-master, who shall record the same in a book to be kept by him for that purpose, and such record shall be open to public inspection.

SECTION 4.—Whenever the Mayor of this city shall deem it necessary, he shall issue an order prohibiting for a certain time therein specified all dogs from running at large on any street, alley, or other public place, in this city, unless such dog be securely muzzled, or led by a line or chain, so as to effectually prevent them from biting any person or animal, which order shall be published in a daily newspaper of general circulation in the City of ....

SECTION 5.—It shall be the duty of the Superintendent of Police, his assistants, and of all the policemen of the City of ...., to take up and impound in such suitable place, or places, as may be designated by the Mayor (of which place or places, notice shall be given by posting a card or notice in some conspicuous place in the office of the Chief of Police, and in the office of the City Collector, and also by publication, of such place or places, in some daily newspaper of the City of ...., of general circulation, to be designated by the Mayor), any dog found running at large in the City of..............., contrary to the provisions of any ordinance, or of any order issued by the Mayor.

SECTION 6.—The City Pound-master shall, immediately upon receiving any dog at the pound, make a complete registry of same, enter the breed, color and sex, and whether licensed or not, if ascertained, and if licensed, he shall, if known, enter the name and address of the owner or keeper, and the number of the license tag, if any, and shall keep impounded licensed dogs separate from unlicensed dogs.

A list of all licensed dogs impounded, if any, shall be immediately sent to the City Clerk, for entry, by the Pound-master, who shall also forthwith give notice, through the postoffice, to the owners or keepers of such licensed dogs, of their being impounded.

SECTION 7.—For every dog taken up and confined in the dog pound, as provided in this ordinance, for which no license tax has been paid, a redemption fee of three dollars, together with the amount of the tax, shall be paid to the City Collector for the use of the city; and upon procuring a certificate from the City Collector, stating that said amount has been paid, and paying to the Pound-master for taking up such dog the further sum of fifty cents, and the cost of keeping such dog, not to exceed twenty-five cents per day, and cost of advertising, if any, as hereinafter provided, the owner or keeper thereof, within five days after the impounding, or any other person, after five days, shall be entitled to redeem such dog, and if such dog shall not be redeemed within five days after being taken up, such dog shall be destroyed by the Pound-keeper, except that at the expiration of the five days allowed for the redemption of impounded dogs, the Pound-master shall advertise immediately in a daily newspaper of general circulation in this city, all unredeemed licensed dogs, if known or identified as such, and if such dogs be not redeemed at the expiration of the fifth day after such advertising, they shall then be destroyed.

SECTION 8.—Any dog for which a license has been paid, which may be impounded for being at large without collar or tag, or without a muzzle, if required (if it shall be made to appear to the satisfaction of the City Collector by the affidavit of the owner or keeper, or by other sufficient testimony, that a license for such dog was procured, and a collar put around its neck, with license tag attached, as provided in this ordinance, or was muzzled, as required by any order of the Mayor, but that such collar, tag or muzzle has been accidentally lost), may be redeemed upon the payment to the City Collector, for the use of the city, of two dollars, and payment to the Pound-keeper his charges, as provided in Section 7 of this ordinance, and the City Collector may deliver to the person redeeming such dog, a duplicate license tag to correspond with the registry, for which duplicate tag twenty-five cents shall be paid.

SECTION 9.—It shall be the duty of the Chief of Police, or any police officer, to kill any dog which may be found in the City of .... without an owner or keeper, or found at large contrary to any ordinance, or to any order of the Mayor: *Provided*, Such dog cannot be safely taken up and impounded, and unless a dog cannot be safely taken up and impounded, it shall not be lawful for any officer of the

City of ...., or any other person, to kill, or attempt to kill, any dog at any other place than the dog pound.

No dog shall be subject to molestation under this ordinance, or under any order of the Mayor, while on the premises of its owner or keeper, and any officer of the City of ...., or other person, who shall invade private premises to capture, entice, or take any dog out, of the enclosure of the possessor of such dog, or who shall molest or seize any dog while held, or led by a line or chain by any person, or who shall bring into the city any dog, for the purpose of taking up and impounding the same, shall, on conviction, be fined in a sum not less than five, nor more than fifty dollars.

SECTION 10.—If any fierce or dangerous dog shall be found at large in the streets of ...., or upon any public place, or upon the private premises of any other person than the owner or keeper of the dog, and shall there annoy or endanger any person thereon, the owner or keeper thereof shall forfeit and pay to the City of .... a sum of money not exceeding ten dollars, for the first offense on the part of said owner or keeper, in permitting such fierce and dangerous dog to be at large; and upon a second or further conviction, for the same offense, a sum not exceeding twenty-five dollars; and it may be part of the sentence, upon such second conviction, that such fierce and dangerous dog immediately be killed, and this sentence shall be forthwith executed by the Chief of Police or any police officer, for which killing the owner or keeper shall pay the further sum of one dollar, which sum shall be included in said judgment.

SECTION 11.—Whenever complaint shall be made and filed with any Justice of the Peace, or Police Magistrate, setting forth that any dog has, in any manner, disturbed the quiet of any person or neighborhood, or has bitten a person within the City of ...., and that the person so bitten was not at the time trespassing upon the person or property of the owner or keeper of such dog, the Justice of the Peace or Police Magistrate, shall issue a summons directed to the Sheriff, Constable or Police Officer, which summons shall be returnable forthwith, and upon the return of such summons the Justice of the Peace or Police Magistrate, shall proceed to hear and determine the matter, and if it shall appear that such dog has so disturbed any person or neighborhood, or that the person so bitten by such dog was not at the time trespassing upon the person or property of the owner or keeper of such dog, the Justice of the Peace, or Police Magistrate, shall order said dog to be removed or killed, and shall issue an order to the owner, or keeper of such dog, to remove or kill it within twenty-four hours from the time of receiving a copy of such order.

The owner or keeper of any such dog who shall refuse or neglect to remove or kill, or cause such dog to be removed or killed, within twenty-four hours after having received a copy of said order from the Justice of the Peace, or Police Magistrate, aforesaid, shall be fined in a sum not exceeding twenty-five dollars, and the further sum of twenty-five dollars for every twenty-four hours thereafter until such dog shall be removed or killed.

It shall be the duty of any Police Officer, or Constable, to kill said dog whenever it shall be found at large in said City of ...., twelve hours after the service of a copy of said order on the owner or keeper of such dog.

SECTION 12.—The word dog, whenever used in this ordinance, shall be intended to mean a female as well as a male dog.

SECTION 13.—All ordinances or parts of ordinances inconsistent with the provisions of this ordinance are hereby repealed.

ISOLATE ALL INFECTED OR SUSPECTED ANIMALS.

For the restriction of the spread of rabies and hydrophobia, it is important that prompt action should be taken with any suspicious animal. When a dog or other animal acts strangely and there is suspicion of madness, the animal should be immediately confined, *not killed*, and kept under observation for a week or ten days. Have the animal examined by a competent physician or veterinary surgeon, and if the animal is rabid the characteristic symptoms will soon be observed. PASTEUR says "the animal will certainly die within eight days. If at the end of that time no symptoms of rabies have been observed, the bite cannot cause hydrophobia, and there is no reason why the animal should be destroyed." If symptoms of rabies do appear in the animal thus under observation, it should be immediately

killed; and, if the animal has bitten a human being, a small portion of the medulla oblongata should be secured and placed in a small vial containing pure glycerine only, for use in experimental inoculations of other animals to determine without doubt whether the animal suspected of rage was really rabid.

If other animals have been bitten by a suspicious animal, they should likewise be confined until it is proved whether or not they are rabid, or until the period of incubation* has past. It is quite frequently the case that valuable stock has been bitten by animals not rabid, and it would be a useless destruction of property destroy such animals. Do not kill an animal unless you have good reason to believe it is rabid, or unless it is a source of danger to other animals and to human life. Of course a dog may run mad when it is quite impossible to secure the dog, and extremely dangerous for it to run at large, where shooting the animal may be the only safe way. In such a case the animal should not be disposed of until it is absolutely certain that no person has been bitten. If a person has been bitten a portion of the medulla should be prepared as described above. If a human being has been bitten and the animal is destroyed there is no way left to ascertain whether or not the dog was really mad, and whether the person bitten has been inoculated with the virus of a terrible disease.

WHAT SHOULD BE DONE WITH A PERSON BITTEN.

It is important that prompt measures be taken for the care of the patient. The wound might be "sucked" and thoroughly cleansed with a large effusion of hot water, at the same time pressing the wound to cause any liquid, poison, et cetera, to ooze out and to promote bleeding. A solution of boric acid would promote bleeding and aid in cleansing the wound. If the wound is on the leg or arm a bandage might be placed between it and the heart. As soon as possible cauterize the wound. There are many cauteries recommended, such as caustic potash, nitrate of silver (lunar caustic), carbolic acid, bichloride of mercury,† match of Paquelin, et cetera, but as these cauteries, with the exception of the lunar caustic, cannot well be used except by a physician, the white-hot iron will probably be most available in all cases, especially in places where the physician is not accessible. Where a physician can be called without much delay, it is best to leave to him the method, and cautery to be used. Very little time should be lost, however, in calling a physician, because immediate action is important and the most effective cauterizations are those performed within half an hour. The hot iron can be used by a non-professional person, while the other cauteries require more care in their application.

Cauterization may or may not be effective in destroying the poisonous virus; but surely, in most cases, will do no harm, and may be the means of preventing an attack of hydrophobia. Most people believe, as does the illustrious PROFESSOR KEEN, that there is "no treatment that will prove effective in cases of hydrophobia except that of PASTEUR." PASTEUR preventive inoculations have been described on preceding pages of this paper.

---

* For period of incubation in animal see page 27 of this pamphlet.
† The bichloride of mercury should not be used stronger than 1 to 500.

The PASTEUR treatment can be secured from two central points in the United States; one in New York City, at the corner of Central Park and Ninety-seventh street, and the other in Chicago, at 65 Randolph street. The New York Institute is under the directorship of DOCTOR PAUL GIBIER, and the Chicago Institute is directed by DOCTOR A. LAGORIO. The statistics on preceding pages of this paper will show the results of the work of each institute.

The cost of treatment is small compared with the value of a human life. I understand that the charge for the treatment alone is ordinarily $200.00, which does not include the expense of living during the period of treatment, which lasts about 15 days.

When it is proposed to send a patient to a PASTEUR institute it should be remembered that it is important to send at the same time the piece of the medula oblongata prepared in the vial of pure glycerine only.

If the person suspected of being infected is himself able, or has friends who are financially able, the problem of securing the treatment is not great. But when the patient or his friends are not able the problem is not so easy, and the question is—

HOW CAN THE PREVENTIVE INOCULATIONS BE SECURED?

In Michigan there is a law which provides that the local board of health shall see that no person sick or infected with a disease dangerous to the public health shall suffer for want of nurses or other "necessaries," which certainly implies that no person is to suffer for want of medical attendance; and, as long as it is recognized that PASTEUR'S inoculations is the only known preventive, no person should be permitted to suffer for want of that treatment. This same statute provides that the expense is chargeable to the county in cases where the patient or the patient's friends are not able. It is not at all improbable that the expense of the PASTEUR treatment might be chargeable to the county in such cases.

In Great Britain and especially in Scotland the municipality has sent many patients to the Paris PASTEUR institute; and in some cases has gone so far as to furnish a medical attendant to accompany the patient. This plan could be employed in the United States.

There is still another way by which the necessary funds might be secured. It is well known that there are many liberal, wealthy men, who are public spirited, and might loan a patient the money to secure the treatment. Then, again, the funds might be secured by means of the subscription paper so commonly used in the relief of the suffering.

SECOND SESSION, THURSDAY, NOV. 22, AT 7:30 P. M.

The convention was called to order by President Merritt. After music "National Hymn," Doctor Gray read the following paper:

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

BY MASON W. GRAY, M. D., MEMBER STATE BOARD OF HEALTH, PONTIAC.

To those attending this convention it may seem unnecessary to name the dangerous communicable diseases. There are, however, many people who seem not to understand which diseases are most dangerous. They are never so cautious as when small-pox is reported in a neighboring town or cholera appears on the seaboard, but they seem indifferent to the fact that they are surrounded by a dangerous communicable disease, consumption, which causes more deaths in Michigan yearly than have been caused by small-pox and cholera combined during the last twenty-five years. In Michigan we have a half dozen communicable and hence preventable diseases aside from the two mentioned which cause annually on an average more than six thousand deaths. The average annual tribute paid to the least offensive one of these is many times greater than is in recent times claimed by small-pox during its greatest prevalence. Why then does not the same wholesome fear of these more deadly diseases obtain? Is it because their preventability is not known, or is it because the fact is not generally understood that there is in Michigan a yearly average of nearly 200 deaths from whooping-cough, 300 from measles, 500 from scarlet-fever, 1,000 from typhoid fever, 1,600 from diphtheria and 3,000 from consumption. If the reason is to be found in either one or both of these causes, here is presented a field for the sanitarian to work in—here is suggested an important preliminary to the successful restriction of the dangerous communicable diseases; viz., the dissemination of information concerning the nature of these diseases and the best methods for their prevention.

When one of the above named dangerous communicable diseases breaks out in a locality, it is not necessary that the community be convulsed with the same unreasoning fear which often prevails on the appearance of small-pox; but it is desirable that there should exist such a general appreciation of their deadly character and of their preventability as would lead the people to insist upon the same prompt and vigorous measures being taken for the prevention of the spread of contagion.

The State Board of Health for many years has aimed to bring this about by spreading information of the nature and modes of prevention of these dangerous diseases. As many of you know, this has been done by sending pamphlets containing the best that is known concerning prevention to those places afflicted with any given disease, to be distributed among the friends and neighbors of the sick.

Supported by public sentiment the local board of health would have little difficulty in enforcing the necessary measure; and a better public health service would be likely to be maintained inasmuch as the people

would be willing to pay a health officer something near what his services are worth. The lack of public support, the lukewarmness and often the opposition of people whose co-operation he has a right to expect, form the greatest obstacle in the way of the conscientious health officer. I recall among other experiences during my service as health officer an instance of this. When I came to fumigate the home of a little girl who had been sick with scarlet fever, her mother, lest it be destroyed, concealed a favorite picture book which the little patient had had by her during her illness. One year later the book was loaned to a playmate who contracted the disease in a fatal form. Many of you know of similar instances and every practicing physician can recall from his experience several such cases.

But, it may be asked, suppose an enlightened public sentiment should demand the suppression of these diseases, how may this be accomplished?

The plans of procedure are all worked out, and most of them are embodied in State laws. The measures applicable to each of these diseases are carefully explained in the several pamphlets which the State Board of Health has issued and which any one can have who may wish to read them. It will be seen on referring to them that in general there are three essentials for the restriction and prevention of these dangerous infectious diseases.

1. On the first appearance of any one of them, the immediate notification of the health officer. 2. In most instances a prompt and complete isolation of the patient from all except the physician and necessary attendants. 3. The thorough disinfection of everything which has been in the sick room and after death or recovery, the fumigation of the room with burning sulphur.

There is created by law in every city, village and township in Michigan a local board of health whose duty it is to enforce these and other necessary measures. If every one of these local boards of health should constantly enforce the requirements of the law and carry out the recommendations of the State Board of Health, a large portion of the several thousand lives yearly sacrificed in this state to the dangerous communicable diseases might be saved. We know positively by the results obtained in those localities where these laws and recommendations have been enforced, that four-fifths or more of these lives might be saved. That these methods are thus effective is evidenced by the fact that in 1891 those outbreaks of diphtheria in Michigan which were neglected averaged about twelve cases to each outbreak and about two and a half deaths; while those outbreaks in which the measures recommended were enforced resulted in only about two and one-fourth cases to the outbreak and only about one death to two outbreaks. Similar results are shown for a long series of years and for all those diseases for which isolation and disinfection are required.

Much more striking results, however, are obtained in the case of measles.

Of all those outbreaks in which isolation and disinfection were enforced there was an average of only about two and one-half cases and no deaths. While the averages for those outbreaks in which isolation and disinfection were neglected were over eighty three cases and one death.

These figures are certainly very encouraging to those who seek to prevent the large amount of sickness and mortality from the dangerous communicable diseases.

They show that we understand exactly how to do it. But in the study of reports made by local health officers it is seen that to make the work generally effective it is necessary to have the co-operation of the people.

It is essential that there shall always be a prompt and efficient health officer and then it is also essential that the people aid him in his good work.

In passing, let us note that while small-pox is subject to restriction by the same methods of isolation and disinfection as these other diseases, we have in vaccination a powerful means of prevention which by its very potency has engendered a false sense of security, resulting too frequently in general neglect of this most useful means of prevention. Herein lies the greatest danger of the spread of this most loathsome disease. If human experience can establish any truth, it certainly has proved that vaccination and re-vaccination will prevent small-pox. The present is a time of unusual danger from this disease. Its prevalence in the larger cities of the country has been the means of its spread to various localites in our State resulting in nearly 200 cases since the beginning of the present year. This should admonish us that this is a good time for all who are unprotected to be vaccinated. Infants should always be vaccinated before the fifth month unless some positive contraindication exists, and re-vaccination should be practiced every five years, also always during the prevalence of the disease.

But while much has been done toward the restriction and prevention of small-pox, diphtheria, scarlet fever and other dangerous communicable diseases, comparatively little has been accomplished thus far in the warfare against the disease which causes as many deaths in Michigan as all other dangerous communicable diseases, and has been charged with causing one-half of all deaths occurring between the ages of fifteen and thirty-five—the period of young manhood and young womanhood. It is needless to say to you that I refer to consumption. To make the fight against this disease more effective, it is necessary that the local health officials and the State Board of Health know where the cases of consumption are located. Then it will be possible to place in the hands of consumptives such information as will teach them how to avoid re-infecting themselves, and it will also be possible for the local health officials to distribute among the friends and neighbors of sick persons literature which will show them how to avoid contracting the disease.

RESTRICTION AND PREVENTION OF THE DANGEROUS COMMUNICABLE DISEASES.

FROM THE STANDPOINT OF A LAWYER.

BY JOHN M. CORBIN, EATON RAPIDS.

The restriction and prevention of dangerous and communicable diseases from a lawyer's standpoint is something like a hunter trying to shoot game that he cannot see or hear. A busy lawyer never has any time to devote to the discovery of the difference between the typhoid fever germ and the cholera baccilli. We know, in a general way, that these diseases do exist, that they are communicable and dangerous, but it is for the physician and chemist to discover and analyze the causes of these diseases, and to mark out the plan of warfare against them. It is the province of the

lawyers and the courts to second their efforts, in preparing and enforcing the necessary legislation to attain this object.

The student of law is informed by Blackstone that the object of the law is rights and wrongs. That there is a mode of enforcing the rights of every man, and of redressing his wrongs in the courts of the law, and this the student believes. He loves to dwell upon the thought that the Golden Rule is the key to the law and its foundation. He discovers wisdom and justice in the well known maxim of the law that, "Each must use his own so as not to unnecessarily injure his neighbor."

The student finds written in the law, that no man has a right to pollute the waters he drinks or which flow by his premises, or to permeate the atmosphere which surrounds him with noxious gases or unwholesome smells, and that he has a perfect right to abate these evils as nuisances, and the courts of the law are open to him for that purpose. Pure water and a healthful atmosphere are God-given rights that no man has a right to take away from us.

Now, as to the practical side of this question: Are these rights of the citizen to demand the prevention and restriction of dangerous diseases such as can be adequately conferred upon him by a private action, or, should it not rather be the State that in almost every instance, should step forward and protect the citizen in these rights, the same as it protects his home and country from an invasion of armed men.

Imagine, for instance, a beautiful river flowing through a healthful valley. A farmer's cottage and home near the bank, he is surrounded by a family of healthy children, and the law says to this man, as a riparian owner, "You have the right to have this water flow by your home unpolluted and wholesome, and any factory, shop, or other thing of any description that pollutes this water and renders it unwholesome for yourself or your family, may be abated as a nuisance, at your instance, and the courts are open to you for that purpose." But, after a time, a large factory, or a slaughter house, perhaps, is started near the river above him, the offal from which is drained into the river, and the refuse from this mill or slaughter house floats down the river and settles upon his land in times of high water, and is left there as the waters recede, to fill the air with malaria and miasma. Of course this farmer has a remedy. He consults a lawyer and goes into court with it, and he finds himself involved in a litigation to abate this nuisance, and required to show by expert and scientific testimony that it is a nuisance, and its effect upon the human system are detrimental to health; that it was the cause of his children's sickness, and that it has depreciated the value of his farm. On the other hand, the wealthy manufacturer looks upon this litigation as one of the incidents of his business, that he must defend to the uttermost his rights, as he considers them, lest they be unjustly restricted and that he will concede to others the right to regulate his business only so far as the law compels him to. Now, I undertake to say that this right of the private citizen to enter into this litigation with his neighbor, is a right of no great value; that with the expenses of the litigation, the bad feeling that it occasions between himself and his otherwise friendly neighbor, and the little that can be realized out of it, makes it a remedy that the citizen shrinks from resorting to.

The point that I desire to make, is that from a lawyer's standpoint, it looks as though the State should take entire supervision of these matters, that when the State Board of Health finds that a stream is being polluted

to the detriment of even the humblest of the riparian owners, it should take the matter in hand, and if proper legislation had not been enacted to make the remedy and its jurisdiction adequate, the State Board of Health should see to it that the proper legislation is presented to the legislature, and use its influence to secure its enactment.

In my own little town, in this county, we have a beautiful river, upon whose banks within a few years one of our best citizens—one of the most genial, friendly and enterprising men we have, has built a large mill. The refuse and saw dust from millions of feet of lumber are every year poured into this river, and the people by hundreds are complaining. A State camp ground, along its borders, where people from all over the State spend a part of their summers, is injured by this decaying saw dust along the banks, and the oars of the boats lift it up from the bottom of the river, and foul smelling gases rise from the troubled waters, and yet no private individual among all of these complaining citizens has felt it his duty to take upon himself the burden of a litigation to compel the abatement of this nuisance, to prove that it was a nuisance, or demonstrate that the decaying saw dust produces malaria. I think this example forcibly illustrates the point that I desire to make, that the State and not the private individual should produce the proof demonstrating that such things are nuisances, that they should be abated, and see to it that they are abated, for two reasons:

1. That it has the facilities at hand for investigation.
2. That if the State Board of Health declares a man's business a nuisance, or that it is liable to spread disease, he is perfectly willing to bow in humble submission to the decrees of the State and State officers, when if his neighbor undertook to enforce the same right, he would look upon hmself as being persecuted and his neighbor as his enemy.

I wish that some time during the session of this convention, we could be enlightened as to the probable effect of large quantities of sawdust being thrown into a river like Grand River, in this county, year after year, and whether there is any danger of its producing disease.

THE RESTRICTION AND PREVENTION OF DANGEROUS COMMUNICABLE DISEASES.

FROM THE MOTHER'S STANDPOINT.

BY MRS. D. B. DAVIDSON, CHARLOTTE.

In speaking upon this important subject, we think of heredity, for to successfully know ourselves, we must know our ancestry; but while heredity refers to what is within; environment, or influence from without, plays an *important* part. Children should be taught by wise mothers and fathers, * * * * the laws of their nature; and not be allowed to enter manhood and womanhood in ignorance. Who can imagine a true mother who dares to neglect the proper instruction and care of those God has committed to her? May we, in the *mental*, *moral*, and *physical*, seek after the best results. In this connection, the thought of the *prenatal* influence is forced

upon us. Much depends upon the mental and physical condition of the mother, as to the strength or weakness of the child.

We feel sure that heredity, prenatal conditions and environments, exert a postive influence on the *child*. Let not a pseudo modesty prevent us from giving much-needed instruction to our children, that will prove a safeguard in every station of life. Show the children something of the wonderful trust, Divinely committed to them. It is said by Sidney Barrington Elliott, M. D., that, "It is the right of every child to be well born, born sound in physique, able in intellect, free from contamination of disease and vice, and able to live a strong, honorable life." Let it be our aim that life in the human family may reach the highest ideal. But the fact remains that there are sickly and delicate children in our homes, from whatever cause, or causes, brought about. We know of no government sufficiently strong to forbid the bans of marriage, to a man who is a victim to consumption or kindred ailments, or to a woman who is suffering from cancerous trouble.

May we, by all legitimate means, try to diminish, if not stamp out the trouble of hereditary diseases, by enlightening the young of both sexes, who are to be the future fathers and mothers in the next generation, that *they* may propagate a purer race. This duty we owe to ourselves, our family, the nation, and our God.

Altogether too large a percentage of the American motherhood fail to nurse their children, either placing them in other hands for care, or where they do not receive proper and sufficient food, thus they forego one of the most sacred rights of motherhood and at the same time the child receives the seeds of disease that causes early death. There is a danger of handing down to our children weak physical frames and overwrought nervous systems, resulting in premature decay and early death. In our hospitals, by care and skill, many of the suffering thousands are aided annually. But it is a sad thought, to think of how many are temporarily tided over for a few years, and then in propagation bring the taint of their trouble on others.

In 1893, the Michigan State Board of Health issued a leaflet, in which we learn that "Diphtheria and scarlet fever are the most dangerous contagious diseases, while the most dangerous communicable diseases are named in proportion to the deaths they have caused, and are as follows:—Consumption, Typhoid fever, Cholera, Whooping-cough, Small-pox, etc.

To prevent the spread of Consumption, disinfect or destroy the *sputa* of all its subjects. This disease carries off about 3,000 annually in our state. Typhoid fever differs from typhus. It is not often contracted from the sick person, but rather from the discharges from the patient. This should be thoroughly disinfected. As bad water is largely responsible for this trouble, boil all suspected water before taking it into the system.

In Cholera, the same precaution, referred to in typhoid fever, should be taken, as soon as the disease appears. Whooping-cough carries off more victims each year, with us than does small-pox. To prevent its spread, disinfect the discharges from the kidneys and bowels.

In small-pox, we are accustomed to hear it said, vaccinate and revaccinate, and soon this trouble will be stamped out. In the above cases, and those of scarlet fever and diphtheria, and many others of somewhat similar nature, it is advised that we keep out of the sick room, unless we can be

of use, and even then hesitate if we are not in physical condition to warrant our being there. Do not unnecessarily expose yourself; do not touch your lips with any food, dish or spoon, the patient has touched or has been in the sick room. Do not wipe your face or hands, or bring in contact with any part of the body a cloth that has been used, or has been near the sick person. Do not wear any clothing worn by the sick person during or or before, or after the time of the illness. Do not touch a sick person with sore or scratched hands. Avoid inhaling the branny scales that peel from a person recovering from scarlet fever. Even though the form of ailment may be looked upon as a mild one, isolate the sick, from all but the necessary attendants, and these should be adults and not children. Do not go directly from the sick room to some unprotected child, or house, any car, or hall, without thorough washing and necessary change of apparel.

To disinfect all the discharges of the patient, use separate vessels containing a strong solution of chlorinated lime. In cities or towns, if you have good sewerage, this may be thrown into the water closets, or buried at safe distance (say 100 feet) from any well. If this is impracticable, let it be received on old cloths and these burned or disinfected at once. Keep the sick room thoroughly disinfected, and properly ventilated that it may be amply supplied with pure and wholesome air.

Not only keep the child away from the sick room, but do not allow even the pet dog, or cat, or any other animal to go from the room of one sick with diphtheria, etc., to a child that has not had the disease. Do not allow a child to enter a water closet, or breathe the tainted air from a cesspool or sewer, into which non-disinfected discharges from persons sick with scarlet fever have entered, or to drink water or milk exposed to such air. Scarlet fever is supposed to be caused by a special contagium or poison which may be conveyed and contracted by personal contact or in rags, hair, clothing, etc.

The very prevalent practice of promiscuous kissing is not by any means a wise or safe thing to do.

Avoid putting pins, or coins used by others in the mouth, for we learn that in just such simple ways, many diseases are carried into new fields. Be careful and know that in your homes the sinks and pipes leading to the cesspools are well trapped. Rooms in which are those sick of measles, diphtheria, or scarlet fever, should first be divested of all unnecessary clothes, etc. The towels, etc., that are used should be dipped in a strong disinfectant solution, before being taken from the room.

DISCUSSION OF THE SUBJECT.

LED BY MRS. G. A. PERRY, CHARLOTTE.

Mr. President, Men and Women:—The thought which impressed me most when this excellent paper was read, is the responsibility of fatherhood and motherhood, and the need of a general intelligence on the laws of heredity. Fathers and mothers would die for their children after they are born. But I believe that with a proper knowledge of these laws they will keep themselves pure for their children before they are born, for the sake of the children that may come.

I think that if the boys and girls were properly instructed, if it were made as much a point of their instruction as the school curriculum, it would make a great change. It makes me realize more and more the responsibility of motherhood. These are important things. The greatest responsibility is with the mother because she is the first teacher of the child. These things need to be thought of. The responsibility of the mother is so far reaching.

I wonder how many mothers in this audience appreciate the life-giving, the disease-destroying power of sunlight and air. I go into the homes and see the shutters drawn—plants could not live there, and yet women try to live there the greater part of their lives, and children try to live there. The mothers need to know these things themselves in order to teach the children. The majority of people don't think as they should do that they are poisoning the air they breathe. We need also to think about, and to give more heed to the regular habits, the proper clothing, the simple diet.

In the presence of so many people who are eminently able to talk upon these subjects I feel that I ought not to take another minute.

Dr. Mary E. Green:—There was one point in the paper of Mrs. Davidson, on which I wish to mention an illustration, and that is as regards the communication of disease from the pet animals of children. Some few years ago they had an epidemic of diphtheria in Hastings, in which nearly one hundred lost their lives. I was told, afterwards, that the first case which was brought in the village or city of Hastings came in this way: a pet cat had been sent from a friend to a little girl living in the city. The child who owned the cat had died, and the mother sent it to a little friend of hers. The little girl who took it died. Little by little the disease spread until more than eighty deaths occurred from that one case, which was the result of the pet kitten coming into that family from a little child which diphtheria had taken away.

H. S. Maynard:—Would you advise that the cats be disinfected or slaughtered?

Answer:—Slaughtering would be preferable.

H. S. Maynard:—Brother Corbin raised a very interesting question for some of the people of this county, and this convention is calculated for local benefit. I would like to ask the State Board of Health what their opinion would be about that matter, whether there is any law now.

Hon. Frank Wells, Lansing:—As it is important to occupy the time until Dr. Vaughan comes, I will endeavor to say something about the question raised,—whether in the opinion of the State Board of Health the putting of sawdust and articles of that kind into the stream does so pollute the water as to render it dangerous to the public health? Can the pollution of the stream be accomplished in this way? We have on the program here, I believe, a paper to be read on water supply, and possibly when that paper is read this question will be answered.

However, I will state this in regard to the pollution of streams, there is a law against it. What constitutes pollution is an important question. A stream may be impregnated with decaying matter and may not produce disease in persons drinking water from it. Each contagious disease is caused by an organism, the specific organism of that disease. If none of these organisms exist in the water it will not produce any of these diseases. Water containing decaying vegetable or animal substance is in a condition to support and permit the growth of these organisms, and when once introduced they may remain in it, and reproduce themselves rapidly. Water in

streams may contain decaying vegetable or animal matter and be safe to use. One would not select it as the best water to drink, but one might drink it a lifetime without producing disease. But as stated before, decaying matter brings it into a condition where it is likely to support the organisms that produce disease. And when even in very small numbers they gain access to such water, they may reproduce with great rapidity, and render the water dangerous to health and life. Hence, to have water that is perfectly safe, you must have water that is free from all organisms of disease.

Water can be made safe to use even if it does contain these organisms by thorough boiling. I mention this fact not in answer to Mr. Corbin, but that you may all understand that you can always render the water that you drink safe by boiling.

The question, to go back to it, of whether the stream that Mr. Corbin alludes to is dangerous to the public health depends upon whether the organisms that produce disease are likely to gain access to it. There undoubtedly would lurk great danger of their doing so. People living on the banks of any stream that is in the condition that he describes this to be would be likely sooner or later to contaminate the water with typhoid or other disease-producing germs.

Dr. John M. Sattler, Manistique, Mich.:—I feel like a stranger in a strange land. I am a representative of the Northern Peninsula, and those who read the daily papers might think that we are not perhaps like other people. I was sent here by our board of health, and I expect to go back to Manistique and carry with me some valuable thoughts.

I heartily approve of the paper read by Mrs. Davidson. I believe that life begets life. I wish that some way would be provided in our legislature to prescribe laws to married and unmarried that would tend to prevent these communicable diseases. We may do all in our power to be clean, we may go to our utmost in that respect, and yet as long as that in us is in condition to absorb these germs, just so long we are going to be contaminated with these results. If you farmers sow your seed in a certain kind of soil that seed developes. It is just so with people, if their systems are in condition to take up the germ and develop it.

Prof. Delos Fall, Albion:—I have heard the whistle of the engine. I am convinced that Dr. Vaughan is not very far away, and I will give him time to get off his overcoat, take those germs out of his pocket and make his bow to the friends here.

While he is doing that I want to offer a thought or two that is on my mind with reference to the prevention of the communicable diseases, or to the prevention of diseases in general, from the mother's standpoint. That is rather a strange position for me to be in, to undertake to say anything from a mother's standpoint; but I have lived with a mother for several years and lived with the children which that mother has trained; and life seemed filled with certain things which she insisted upon with reference to the interest and well being of her children.

There is danger for a child, greater danger for the children than for any other people from this source. Twenty-five per cent of those who die, die under one year of age. Thirty-five per cent of all who die, die under five years of age. Something like ten or twelve per cent of those who die, die, within the ages of those who are attending school. And in large numbers they die of germ diseases, communicable diseases. In a good measure we are helpless unless we have the support of all the peo-

ple, in seeing to it that every case of communicable disease is isolated, and that for every outbreak there shall be but one case, and that the outbreak shall stop there. But what I wanted to say was that I believe it a matter of a great deal of importance to attend to the minor details in regard to the health of our children, such as clothing, exercise, proper air, etc. These children that I know most about are kept warmly dressed always; that is insisted upon. The erring is rather on the other side, that the child shall be somewhat uncomfortable from over heat than from the danger of becoming chilly and catching cold.

These children are always kept with dry and with warm feet. They are kept as nearly as possible in an equable temper. The whole attention of the mother is given to making them comfortable in a rational way. It is important that they have good food, not rich food; so the whole family, father mother and all have to eat plain food, and the luxuries are done away with. So in many ways children are preserved in their normal health, with that vigor of body which enables them to resist the ravages of the disease germs.

I have the very great pleasure of introducing Dr. Vaughan to this audience.

THE GERM THEORY OF DISEASE.

BY PROF. VICTOR C. VAUGHAN, M. D., PH. D., MEMBER STATE BOARD OF HEALTH, ANN ARBOR, MICHIGAN.

[Abstract.]

I want to make my talk as practical as possible. Where are the germs which cause consumption to be found? How may we destroy them and thus prevent the spread of the disease? The air which is exhaled from the lungs of a consumptive is wholly free from germs. There is no danger of contracting the disease simply from the breath of consumptives. The air which comes from moist surfaces is practically always germ-free. The walls of the air cells, of the bronchial tubes, and of the trachea being moist, the air exhaled from the lungs does not contain germs. The germs which cause consumption are present in the matter which the consumptive coughs up from his lungs. In order to lessen the spread of this disease, we have only to provide for the thorough disinfection of all the matter which the consumptive coughs up. The consumptive should not spit upon the floor or upon the street or into his pocket handkerchief, but he should have a piece of cloth, or better still a spit-cup prepared of non-permeable paper, and these should receive the sputum, and then the whole should be burned. There is probably no public hall of any kind in this State, the walls of which have not been infected with the germs of consumption. The consumptive spits on the floor; this matter dries, and when the floor is swept, the dried material rises as dust which finally settles on the walls, benches, or other articles of furniture. If this be true, it may be asked how does it happen that all of us have not died with consumption? Persons in ordinarily robust health will destroy a considerable number of germs accidentally introduced into the body. The blood of each of us contains a germicidal substance which varies in amount and efficiency from day to day. If we happen to be slightly ill at the time when the germ of consumption is inhaled, this germicidal substance in the blood

fails to be effective and disease results. It is a common belief with many that consumption is due to taking cold. This is true only so far as the cold lowers the vitality of the individual. I have brought along with me some of the germs of consumption. The coating which you see in this tube consists of a great mass of these germs. It is claimed by some that there is as yet no proof that this germ is the cause of the disease. If you will bear with me a little, I will tell you what evidence we have that this germ is the cause of consumption. This germ was discovered by Professor Koch in 1882. It is found in the sputum or in the tissues of all persons suffering from this disease. It has been isolated from everything else. It has been grown through many hundreds of generations artificially. Healthy animals inoculated with it invariably develop the disease. These experiments have been repeated time and time again by hundreds of careful, conscientious men, and the result has been invariably the same.

Consumption is a disease altogether too common among us. Each one should make himself or herself a missionary to do what can be done to prevent the spread of this disease. As I have stated already, the matter coughed up by the consumptive should always be burned. The State Board of Health will probably ask this next Legislature for an appropriation to enable us to take care of those consumptives who cannot be isolated in the homes of the poor. There are many such in the State. Among the workmen in any large factory, you are likely to find one or more consumptives. These men, without intending it and without knowing it, are inoculating their friends and neighbors with the same disease. We claim that it would be a humane thing for the State to take these people and take care of them. Cure them if possible. If not possible to do this, at least teach them how to prevent the spread of the disease. This is certainly an important matter. More than one hundred thousand people die of this disease annually in this country. Knowing the cause of it and knowing how to prevent it, as we do, shall we sit idly by and do nothing? It seems to me that this is a matter that concerns all of us. Certainly, it is one of the most important things that men can talk about, and one which should lead us to action. It is something that concerns the life and happiness of the people.

There is one other disease about which I wish to say a few words. Diphtheria is also due to a germ. This germ can be easily detected and recognized. The most careful and conscientious physician is likely to make a mistake in diagnosis from a simple inspection of the throat. The State Board of Health offers to solve all doubtful questions of this kind that arise. From the Laboratory of Hygiene at the University, we will send to a physician who may wish such an examination made, a little box like this, which has been devised by the New York City Board of Health. This box contains two test-tubes. One of these contains a nutritive material upon which the germ may be placed. The other tube contains a little swab. The doctor removes a little of the material from the throat with the swab, spreads it over the nutritive material, replaces the swab in the other tube, readjusts the sterilized cotton in the mouth of each tube, and returns the box to the Hygienic Laboratory. We make a microscopical examination and are able, after a few hours, to determine whether or not the germ of diphtheria is present. I shall be glad now to answer any question that any one cares to ask me.

Question. I would like to ask the doctor if he believes in an inherited consumption, that is, if the children can inherit the disease from their parents?

Answer. Inherited consumption is a very rare thing. It does occur in a few instances. Very rarely, children are born into the world consumptive. In this case, they generally die before they are two years of age. In the great majority of instances, consumption is not due to heredity but is due to contagion.

Question. May one be predisposed to it?

Answer. Of that there can be no doubt.

Question. Do you consider a strong person practically free from the possibility of acquiring consumption?

Answer. No. The strongest and most robust person, getting a sufficient quantity of the germ, contracts the disease.

Question. How long do guinea pigs live after they have received this germ?

Answer. As a rule, four weeks, sometimes longer.

Question. What is the best disinfectant?

Answer. Fire is the best and surest disinfectant. The best disinfectant for walls and floors and furniture is probably corrosive sublimate.

Question. I understand from your statements that you do not look upon children born of consumptive parents as coming into the world with the seeds of the disease.

Answer. I think that such is a rare exception. Of course, the children of consumptive parents are likely to lack in general vigor and strength.

DUTIES AND POWERS OF HEALTH OFFICERS.

BY H. S. MAYNARD, ESQ., CHARLOTTE.

A health-officer, who is competent, who understands his powers and duties well, who exercises the former with judgment, with kindness and courtsey and gentle consideration for the feelings of others, while inflexible and unswerving in the necessary exercise of it, and at the same time is alert and prompt, energetic and active in fulfilling the latter is a bulwark of saftey and a blessing untold to the community which he serves, and he is worthy of good compensation and hire. He saves the people much expense that they would otherwise be put to and the weary agony of many sick rooms. He makes it possible for many to retain the joy and comfort of their sweet little ones, when, were it not for him their innocent souls would be driven across the dark river to the unknown shore, by the foulness and impurity of their earthly homes.

On the other hand, a health officer who is incompetent, who does not properly understand his powers and duties, who is negligent and unfaithful, who allows himself to be deterred or swerved from performing his whole duty by motives of interest, fear or favor, who is slow and slothful in the performance of his duties, is a bitter curse and calamity to the community afflicted by his official *malfeasance*, and his most appropriate reward would be six months, and from that to death by hanging.

Many times a health officer, by merely failing to attend to some threatened danger from contagion, infection or some foul nuisance, when he has or should have knowledge of the danger, is answerable for an epidemic that sweeps off many tender little forms,—and some good tough ones besides.

On these occasions, the minister who conducts the last sad obsequies,

speaks of the death as being something dealt out by an all wise over-seeing providence to accomplish some inscrutable purpose of the Infinite Power. This may be true, but it looks like blaming our Heavenly Father for the dereliction of the health officer.

But if a community would receive the greatest benefit possible from the services of the health officer, it should fully inform itself of the powers and duties of such officer, and then yield the most cheerful obedience to the rules and directions of the health officer, and freely and promptly give him information of any threatened or even suspected menace to the public health.

A health officer should as promptly, thoroughly and energetically investigate and attend to a case of *suspected* danger as to one well known to be dangerous. Indeed, to illustrate, if a house is *known* to have in it a case of small-pox, there is not half the danger of spreading the disease, that there *would* be if the case were there and the people did not know the disease to be small-pox.

A health officer had better err by making a false alarm, and guarding against *possible* danger than to let a danger go uncontrolled while trying to determine whether there be cause for alarm or not.

The powers of a health officer, or the authority on this subject which he represents, is said to be almost unlimited in some situations over the persons and property of the people.

Given the necessary condition and the law is ample for the health officer to do anything in his judgment necessary, in reason, to stamp out any danger threatening public health.

But there is no fixed and arbitrary rule independent of circumstances to circumscribe or enlarge his powers.

His power is given by application of the principles of the law of self-preservation, and a consideration of the public good.

He stands as the guardian of the *public health* with the lawful right to strike all enemies attacking it. To illustrate: A person in the solemn hours of the night is warranted in taking human life, if he believes it necessary to defend his domicil from invasion. A person may strike a blow in his own defense, and in case of threatened assault he need not wait until first struck before giving a blow to defend himself. In case of fire, in populous precincts, the authorities are warranted in pulling down buildings to prevent the spread of the fire.

But a power may be given, with regard to health regulations, in a dense population that would not pertain at all in a district thinly inhabited. In organized society the freedom of individuals must ever give way to, and be curtailed or modified by, the requirements of the *public good.* A man in an uninhabited country or in the forest may lawfully fire a gun in any direction. In certain parts of a city it is unlawful to fire a gun at all, because of possible danger to human life. A man on his farm may go into an open field and spit anywhere he chooses; but let him start down a crowded street and spit over his left shoulder and hit a man in the eye, and then over his right shoulder and hit a woman in the face, and he is liable to be arrested for the crime of assault and battery; yea, he is liable to be beaten black and blue by an enraged people. It is upon the application of the law of self protection and the paramount consideration of the public good, that the power of the health officer rests.

There is no lawful authority to compel a sane individual to keep clean or to take medicine to save his life. He has the right to rot or die

in misery, without attendance, if his doing so does not affect the public or himself to the small-pox and go away into solitude and enjoy the freedom other persons than himself. A man has the right if he be sane to expose of having that jolly disease and live or die with it, and if it only affects himself the authorities cannot interrupt his solemn pleasure. But let him come into a community, while he has the disease, where there is any danger that he will share his fun with others, and the authorities may imprison him, burn his property, do anything necessary to protect society from the attack or threatened attack upon it.

I might keep a foul pig-sty in an uninhabited neighborhood, and sleep over its foulness, breathe in its impurities, and die by a proper visitation of God as a consequence, and the authorities could not control my way of amusing myself, but let any person have such a nuisance where the public is liable to be affected by it, and the health officer may tear down, destroy, or do anything in his judgment necessary to protect the public.

The law provides that every board of health shall appoint and constantly have a health officer who shall be a well-educated physician and act as a sanitary adviser and the executive officer of the board, thus showing the policy of the law to be, to give the people the best protection possible. (Health Laws, Sec. 20.)

The law provides every community with a board of health. The boards of health are authorized to make such regulations respecting nuisances, sources of filth and causes of sickness, in their localities, as they judge necessary for public health and safety. (H. L. Sec. 22.)

The board of health *shall* examine into all nuisances, sources of filth and sickness, etc., and shall destroy, remove, or prevent as the case may require. (H. L. Sec. 25.)

The board of health may make rules and regulations in relation to the care and cleansing of privies and water-closets, and may declare any such privy or water-closet to be a nuisance, and may abate the same, and any-one disobeying such rules and regulations is guilty of a misdemeanor, and may be fined or imprisoned. (H. L. Sec. 33-34.)

Sec. 48, H. L.—"*The People of the State of Michigan enact*, That whenever the health officer of any township, city, or village in this State shall receive reliable notice or shall otherwise have good reason to believe that there is within the township, city, or village of which he is health officer, a case of small-pox, diphtheria, scarlet fever, or other communicable disease dangerous to the public health, it shall be the duty of said health officer, unless he is or shall have been instructed by the board of health, of which he is executive officer, to do otherwise, immediately to investigate the subject, and in behalf of the board of health, of which he is executive officer, to order the prompt and thorough isolation of those sick or infected with such disease, so long as there is danger of their communicating the disease to other persons; to order the prompt vaccination or isolation of persons who have been exposed to small-pox; to see that no person suffers for lack of nurses or other necessaries because of isolation for the public good; to give public notice of infected places by placard on the premises, and otherwise if necessary; to promptly notify teachers or superintendents of schools concerning families in which are contagious diseases; to supervise funerals of persons dead from scarlet fever, diphtheria, small-pox, or other communicable disease which endangers the public health; to disinfect rooms, clothing, and premises, and all articles likely to be infected, before allowing their use by persons other than those in isolation; to keep the president of his own board of health, and the secretary of the State board of health constantly informed respecting every outbreak of a disease dangerous to the public health, and of the facts so far as the same shall come to his knowledge, respecting sources of danger of any such diseased person or infected article being brought into or taken out of the township, city, or village of which he is the health officer."

Sec. 49, H. L.—"In the absence of regulations conflicting therewith, made and published by the local board of health, and still remaining in force, the provisions of section one of this act shall have the force

of regulations made and published by the local board of health; and whoever shall knowingly violate the provisions of section one of this act, or orders of the health officer made in accordance therewith shall be made guilty of a misdemeanor, and upon conviction thereof he shall be punished by a fine not to exceed one hundred dollars, or imprisonment not exceeding ninety days in the county jail, in the discretion of the court.—As amended by Act 34, Laws of 1889."

Thus it is seen that the power of the health officer is powerfully backed by the penal arm of the law, so that it is dangerous and criminal for any person to neglect or refuse to obey the orders of the health officer. The people and physicians are further compelled to notify the health officer of dangerous diseases. (H. L. Sec. 44–45).

Sec. 44. Whenever any householder, hotelkeeper, keeper of a boarding-house or tenant shall know, or shall be informed by a physician, or shall have reason to believe that any person in his family, hotel, boarding-house or premises, is taken sick with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof in writing to the health officer, the president, or the clerk of the board of health of the township, city or village in which he resides. Said notice shall state the name of the person sick, the name of the disease, if known, the name of the householder, hotel keeper, keeper of boarding house or tenant giving notice, and shall, by street and number, or otherwise, sufficiently designate the house in which he resides or the room in which the sick person may be; and if he shall refuse or willfully neglect immediately to give such notice, he shall be deemed guilty of a misdemeanor, and upon conviction thereof he shall be punished by a fine not exceeding one hundred dollars and the costs of prosecution; or, in default of payment thereof, by imprisonment not exceeding ninety days in the county jail, in the discretion of the court: *Provided*, That such fine or imprisonment shall not be enforced if a physician in attendance has given to the health officer or other officer hereinbefore mentioned an immediate notice of said sick person and true name of the disease, in accordance with the requirements of this section.

Sec. 45. Whenever any physician shall know that any person whom he is called to visit, or who is brought to him for examination, is infested with small-pox, cholera, diphtheria, scarlet fever, or any other disease dangerous to the public health, he shall immediately give notice thereof to the health officer, the president, or the clerk of the board of health of the township, city, or village in which the sick person may be; and to the householder, hotel keeper, keeper of a boarding house, or tenant within whose house or rooms the sick person may be. The notice to the officer of the board of health shall state the name of the disease, the name, age, and sex of the person sick, also the name of the physician giving notice; and shall by street and number, or otherwise, sufficiently designate the house or room in which said sick person may be. And every physician and person acting as a physician, who shall refuse or neglect immediately to give such notice, shall forfeit for each such offense a sum not less than fifty nor more than one hundred dollars: *Provided*, That this penalty shall not be enforced against a physician if another physician in attendance has given to the health officer, or other officer, hereinbefore mentioned, an immediate notice of said sick person, and the true name of the disease, in accordance with the requirements of this section.

The strength and majesty of the law is thus evoked to compel all the people to disclose any serious or dangerous disease that may be within their knowledge, and to compel officers, whose duty it is to look after these things, to protect the people from these threatened attacks upon the public health. This tremendous power is put in the hands of the health officer, not for his aggrandizement, but simply that society may protect itself. Any pecuniary loss the individual may be put to, must, in many cases, be made good by the State; but the first thing to do is to protect the public health at all hazards, the private pecuniary considerations must take care of themselves afterwards.

The law provides many regulations; the board of health may when authorized provide many more. Justices may issue warrants to carry them into effect; the prosecuting attorney must prosecute all offenders, and thus society protects itself.

The duties of the health officer are to execute these laws. He should keep himself informed of the sanitary condition of the premises of the people in his jurisdiction. He should keep himself well posted as to the presence of any communicable diseases. He should be prompt to eradicate any nuisance, cesspool, source of filth or sickness. He should stand like a rock to ward off approaching danger of any kind. He should be firm, true, unswerving and unyielding in the discharge of his duties, and above all he should be a man of tact.

If he is a true disciple of Esculapius he will then have a great happiness in the inner consciousness of having saved many human lives from sickness and death.

If he is not faithful to his trust he deserves to be permeated and filled with all the contagion, infection, bacteria and bacilli that he permits to get into his jurisdiction, and to be finally choked with the big words of his profession, and then laid in an unhonored grave.

Long live the competent health officer!

DISCUSSION OF THE SUBJECT.

Henry B. Baker, M. D.: I have been very much interested in this presentation of the subject, and I have been very much gratified to see that there are so many here this morning to listen to this presentation.

Perhaps the best that I could do at this time would be to emphasize the points made by the preceding speaker.

(Pointing to the word "consumption" on the diagram.) This is the disease which caused the most deaths in this State during the years 1876–1887. Consumption is the most important disease, because it causes the most deaths in Michigan.

Formerly we used to think that the function of the health officer was the abatement of nuisances. But the health officer cannot abate a nuisance except as he carries out the orders of the local board of health. People formerly had an idea that a health officer was simply a man to smell out nuisances and abate them. But that is not his principal duty. The law specifies the duties of the health officer, and the laws have been read to you just now. The powers and duties of the health officer are of most consequence of course, with reference to those diseases which cause the most deaths. And those diseases are communicable. Perhaps you did not notice that consumption was not mentioned in the law. But consumption is now known to be the disease which is most dangerous to the public health. It is *the* dangerous disease.

I wish to call your attention to the relative importance of a disease concerning which all are very much frightened,—small-pox. No one need to have the small-pox unless he wants it. If he does not want to have it, he can be vaccinated. And from this diagram you will see that small-pox is at the bottom of the list of dangerous diseases. That diagram gives you an idea of the duties of the health officer. The first duty is with regard to that disease which is of most consequence. Probably you might be reminded of your own duties, and report the diseases which are most dangerous to the public health. What we want to do is to see that our health officers, and we ourselves work with reference to those things that are of most importance. In 1873 the State Board of Health was organized, and one of the first works it set itself to perform was to educate the health

officers and the people to a knowledge of the fact that scarlet fever was preventable, and just how to prevent it. Previous to that time, the average mortality was nearly five per ten thousand inhabitants per year. In 1873 the State Board of Health commenced its work of aiding the health officers around the State in teaching the people of the State how to prevent that disease. At the close of the year 1890, taking all of the years since the board was in existence, the mortality from scarlet fever had been cut right in two. There was no longer as much by one-half. And since that time, further progress has been made. That is cause for congratulation, but it does not fully satisfy us, for this reason: Where the recommendations of the State Board of Health have been fully observed in Michigan four-fifths of the mortality from the disease has disappeared. I want to make that point clear if I can, and to show you that the health officer's duties amount to something, and can be made to pay in dollars and cents. Scarlet fever has been reduced about one-half. In those localities where the disease has occurred and the health officer and the people have done their duty, four-fifths of the mortality has disappeared. That is in localities after the disease has entered the place. After the disease has entered the place, four-fifths of the ravages, which without restrictive effort will occur, can still be prevented. What does this mean? It means that that disease is not caused by nuisances, which formerly were generally supposed to cause disease, but scarlet fever is caused by contagion. I mention this to emphasize the point that the health officer's duties are more in reference to the germs of communicable diseases than they are with reference to nuisances.

In consumption the germ is not usually reproduced outside the body. It goes from person to person. The same is true of diphtheria. The same is true of scarlet fever; four-fifths of it, after it has been introduced, may be prevented.

Typhoid fever has reference to nuisances, very strongly. That disease may be spread by filthy surroundings. But the cleanest linen handkerchief that comes in contact with the germ of scarlet fever may convey it. Out of that whole list (referring to the diagram) only one disease (typhoid fever) has reference to nuisances; the others are spread from person to person.

Mr. Maynard: May I ask you one question? If the locality is permeated by nuisances is not a person who lives in such a locality a little more apt to be affected by these germs if he comes in contact with them?

Dr. Baker: Oh, yes. Possibly. But even that is not certain.

Mr. Maynard: It does have something to do with it, doesn't it?

Dr. Baker: Yes; so far as relates to typhoid fever, but it is so small with regard to these other important diseases.

Mr. Maynard: I think it would be an aid however, to the health authorities in stamping out the lives of these germs to have the premises in reasonably good condition.

Dr. Baker: I agree with Mr. Maynard that it is a very proper thing to have cleanly surroundings. But it is exceedingly important that the old and false ideas of the causation of diseases shall be displaced by the truth; and the most important diseases, with the exception of typhoid fever, are not caused by filth; and even that disease is not usually caused by nuisances, but by impure drinking water.

Rev. D. B. Davidson: Just a word or two, please, in the immediate connection of the authority or the power of a health officer or local board

Some years ago I was called to attend a funeral of a child that had died of diphtheria. The board of health had granted a public funeral, and yet it was known that the child had died of diphtheria.

Later, in an eastern city the physician in charge came to me and said: "Now there will be a funeral there tonight or tomorrow. We have had that plague of diphtheria here, probably more from that than from any one cause, for the past ten years. I forbid you, as an officer, to go into that house." No clergyman was allowed to go into that house. The mother of that family became very much enraged. The members of the board had previously notified me. The mother took special cause of offense because I declined to go into that house and hold that funeral. There was one or two hymns read, and a portion of scripture read. I don't know but what they feel angry yet. There was the point of the authority of the local board.

They took this precaution that they might stamp the disease out. And the disease in that case *was* kept in that one inclosure. It never went out of that house. The local board felt that it was due to the precautionary steps that they had taken, and in the enforcing of the law which they had begun.

SEWERAGE, DRAINAGE, AND THE DISPOSAL OF WASTE.

BY G. B. ALLEN, M. D., CHARLOTTE.

In considering these questions as subjects for our paper, we will for convenience, divide them in conformity to the relation in which they appear as the subject.

Disposal of Waste.

In the present stage of civilization great is the accumulation of material which has been used, served its purpose, and is thrown aside as no longer useful; to this class of waste let us apply the term of *garbage*. Garbage may be again divided into two classes,—first that which is *inorganic*, or not subject to putrefaction and decay; and second—that which is *organic*, or subject to putrefaction and decay. In the first, as to its relation to the causes of disease they may, in themselves, be comparatively harmless, but their presence may be a nucleus for disease germs, or a receptacle for disease itself; to particularize, dust, sweepings from house or premises, ashes, broken and refuse articles,—such as broken dishes, implements, etc., tin cans, old shoes and garments; these are all unsightly and may be merely obnoxious only to the eyes; yet what to do with them? The city has not made any permanent arrangement for their disposal.

I would suggest that each year the common council should designate a place where such garbage be placed, and that it might be used to fill depressions in streets or unused property, and afterward covered with earth. All this may seem trivial, but many of us have found it a source of great annoyance, as draymen can charge much more than it ought to cost were there provided some place where it could be lawfully deposited; and then again it would add much to the beauty of our streets and surroundings to have such unsightly garbage removed from our vision, were some uniform plan adopted.

Organic Waste and Garbage.

In this class we will mention vegetable parings or their unused portion, remnants of food unused, decaying matter, etc., together with the liquid kitchen slops. Here there is a menace to health and life unless some precaution for their removal is adopted. No systematic *permanent* plan has, as yet, been adopted. Some years the board of health have recommended that the kitchen refuse, both liquid and solid, be kept in suitable barrels or other receptacles, and to be removed at stated times, but generally boards of health have not even required this precaution, and never, so far as my knowledge goes, has any provision been made by the authorities for its final disposition, at the expense either of the individual, or the corporation, with the exception of, perhaps, blocks 23, and 32, when in some years the city has regularly caused its removal at the public expense. It has seemed to me to be practicable, that the city could do this without great expense to the taxpayers, by employing some responsible person, to make regular rounds and gather such garbage, say twice a week in the months between April and October, and once each week for the other months, requiring all householders to have suitable covered receptacles to deposit the waste and garbage for their own household. The aggregate expense of some system would be much less than for the single individual per capita.

This could be accomplished without great cost, in part at least; should the authorities require all householders to have the required garbage receptacles in sufficient numbers, and proper condition, so that the kitchen refuse were by itself in one receptacle, as that could be utilized for feeding swine and could be readily disposed of. In any event *some* organized municipal plan is to be desired.

Disposal of Human Excreta.

Without a system of sewerage, or other municipal plan of disposal of any form of garbage and excreta, the city of Charlotte has to depend principally upon a few primitive methods, namely: vaults either water tight by cementing walls made within the earth, or simply an excavation into the ground, with its accompanying out house, or a closet with drain emptying into a cesspool, or a closet of the dry earth system, or merely surface drainage.

Fortunately we have a very excellent system of water works and an abundant supply of healthful, wholesome water, the supply of which is for the present, at least, removed from danger of contamination. There are a number of our people who use wells for their supply of water; these should have the protection of our health authorities, and to this end no privy vault should be permitted less than seventy-five feet, nor a cesspool less than one hundred and twenty-five feet from any well, the water of which is used for drinking purposes, unless such vaults or cesspools are made thoroughly and completely water tight. The reasons for these measures are obvious, when we consider the nature of the soil, and the existing imperfect conditions of drainage; soil being sand and gravel, and the certainty of soil infiltration by contaminated fluids, and semi-solids. Should a system be adopted by the city, of regularly removing garbage, then, for many reasons, water-tight cesspools and vaults would be the

better ones. The first added cost of construction would be compensated for by their permanence, ease of removing contents, and facility of keeping them more thoroughly disinfected.

Great care should be exercised in all vaults and cesspools wherever they communicate with the house by drains, to have such drains most thoroughly trapped to prevent return of sewer gas, and in all such vaults and cesspools there should be secured perfect ventilation into the open air by a ventilating shaft high enough to carry the gases above windows and chimneys. It is to be hoped that the future will give us something better than those abominations, the cesspool and vaults, but it should be our present care to render them as harmless as practicable.

Of excreta of animals other than mankind less can be said. The value thereof as a fertilizer, usually is an incentive to its removal. The fear of an epidemic of some dread disease, as diphtheria, or cholera, will stimulate a board of health to activity, and a general cleaning up of the city occurs, but like those dreaded appearances the time for sanitary work is very uncertain, and many times indefinite.

There are a few blocks in the city where periodical cleaning up of the gutters is enforced, and where the removal of animal excreta is paid from out the city treasury. Why not make it general and thereby create some systematized plan, and thus give us regular and thorough cleanliness and sanitary inspection?

It is believed the average cost would be no more in a term of years than with the present paroxysmal plan and we could be assured of a reasonable, healthful and tidy condition.

Drainage and Sewerage.

Our city's site is, fortunately, on a small prairie, and is about two miles in length, by about one and one-half miles in breadth. For the greater portion of this area, the soil is sandy, with the underlying stratum of gravel and sand. The smaller portion and that most elevated has a clay soil, but the elevation of this part of the city insures pretty certain surface drainage, and only in extreme wet seasons are the cellars found to contain water even in this locality.

On the northeast boundary the Butternut creek drains the surface water. This is a small stream about twelve feet in width, fed by springs, with but little volume of water, and having quite a fall has comparatively quite a strong current. On the south and southwest, runs Battle creek, another small stream of an average width of perhaps twenty feet; its average summer depth will hardly exceed twenty inches, and it has a current of perhaps two miles per hour. But little of the surface water from the city is drained into this stream within the limits of the city. The greater part of it is carried by surface drains, by way of the county ditch, through the Brackett addition to the southwest. As previously mentioned the soil is for the most part sand and gravel, excess of surface water readily finds its way into the porous soil, and all debris remaining on the surface, is subjected to the purifying and oxydizing influence of sunshine and air. Our location and soil are healthful. Since the introduction of our present system of water supply, typical typhoid fever has become extremely rare. Neither have we suffered from any general epidemics of zymotic diseases. Situated as we are, the query comes, are not open drains,

in such soil as we have, more favorable to health, than closed sewers, with the modern imperfect plumbing and still more imperfect connections and final outlet?

To those who favor sewerage I wish to call attention to surveys made in 1891, in reference to a proposed sewer to be constructed jointly by the county and the city. The first survey had, as a starting point, the Congregational Church, thence to Butternut creek, a distance of 296 rods, and with a grade or fall for surface of 36 feet. For the sewer excavation, from bottom, at a depth of 6 feet from starting point the entire fall of grade represents 30 feet, or about 1¼ inch per rod. The deepest cut is at Elbow St. 16.17 feet. At a distance of 160 rods, it is less than four feet to the bottom of the excavation, and at 220 rods it is less than two inches, and, for some distance, it is barely below the surface of the natural formation of the ground. A main sewer with such a grade, so near the surface would be impracticable, even had Butternut creek sufficient volume, and capacity to remove satisfactorily and safely the contents. And a sewer built on the surface of the ground would be, in our latitude, an unique affair.

Another survey was made in May, 1891. Starting from southeast corner of the court house square, thence directly south to Battle Creek, on Cochran Ave.; by this survey the fall of the surface was 28 feet for the entire line. The bottom of the proposed sewer at the starting point was 6 feet below natural surface; the entire distance was 430 rods and its fall for entire distance 24 feet. This gives us not quite ⅛ of an inch fall per rod. The deepest cut is, 24.5 feet. From Seminary St. to Henry St. there is no place where the bottom of the sewer line is more than 4½ feet below natural surface line, and in many places less. So that to get this slight grade of 1.58 of an inch for every ten rods, the bottom of the proposed sewer must not be more than 4½ feet below the natural surface of the present grade of the street for several blocks on Main street. Neither is it certain that Battle creek could be used as the receptacle for our sewage. The volume of water is small, and in the hot summer months there is very little water, and many shoals appear which would be but so many "catch basins," for the city's offal, and that, too, in the season of the year that would cause most offense, and danger. A system of underground ordinary sewerage seems for our city impracticable, and what other dependence can we find? Sewage farming will be more possible. Many English cities have them. Berlin, Germany, has this system, and it is said to yield something of a revenue to the city. In Los Angeles, Cal., they have this system. Also at Pullman, Ill., and is reported as quite satisfactory from the sanitary standpoint. It requires a large outlay of money to establish the system; but it returns a revenue, and probably would at least, pay a part of the expense of operating. In the first place it would require a tract of land of from 75 to 150 acres. Conducting sewers, or drains, machinery for pumping and for pressure, reservoirs for receiving fluids, presses for compressing solids and semi-solids. The reservoirs which are situated on the land to be used, are intended for the purposes of receiving the sewage, and by the use of chemicals, solids are precipitated, and the clear fluids are distributed over the surface of the land and serve the purpose of both irrigation, and fertilizers; the solids are compressed and made into fertilizing material. To those who feel interested in this subject, a full description was given in the "Scientific American" of, I think, 1881.

Within the past few years cremation furnaces have come into quite extensive use in Europe and America, as a means to dispose of garbage and excreta. These burn and destroy these products. Among the most successful of these furnaces are the Mann, Rider, and Engle systems. The Rider system is in use in the cities of Allegheny, and Pittsburg, Pa., and have given satisfaction. The Engle system is, I believe, the one more generally used in the United States. They are built in various sizes, to accommodate cities from 2,000 to 40,000. This system was the one adopted on the grounds of the Chicago World's Fair Exposition at Jackson Park, and Dr. Morse published a report of the system in the "New York Sanitarian" of December, this year, and from which I wish to quote from a paper by Dr. J. T. Redelings read at Menominee State Sanitary Convention last April.

"From an area of 600 acres, with a resident population of 40,000, and a daily attendance of from 150,000 to 300,000 visitors, it was estimated that the garbage, refuse, and waste of all kinds that must result from their presence would be nearly 100 tons per day, all of which must be collected and disposed of within the bounds of the Exposition, there being no legitimate outlet by land or water for such a purpose. The sewage from the grounds was forced by compressed air into large receiving tanks at the cleaning stations, being about 2,500,000 gallons daily. After treatment by chemicals, and the precipitation of the solids to the bottom of the tanks, the clarified water was run off into the lake and the residue pumped into sewage presses, and formed into sludge cakes. * * * * An analysis of this sludge gives moisture 58%, and dry matter 42%. Of this dry matter, there is about 18% of combustible material, being 6 to 8 parts of oily or soapy material and 10 to 12 parts of paper pulp and fœcal waste, the remainder being ashes, lime, earth, and chemical and mineral products.

Thus only 18% of the original sewage bulk can be actually burned. * * * *

The garbage from the grounds somtimes contained as much as 25% of ashes which always retards combustion and increases the labor of pressing it through the furnace grates. * * * * The quantity of liquids contained in the garbage was very large. During the five months that the crematories were used there were about 5,732 tons of sewage cake and garbage brought to the furnaces, also a large amount of stable refuse, and damaged food stuffs, besides the bodies of dead animals."

The fuel used in their combustion was crude petroleum.

The largest quantity used in one hour was 71 6-7 gallons used by six burners. The average of an eight days' test being 37½ gallons per hour, or 6⅓ gallons for one burner per hour." (The crude oil in quantities can be purchased at less than 3 cents per gallon.) "It was estimated that the cost of combustion of these miscellaneous materials will not exceed 50 cents per ton." The ashes or residue from this system has no great commercial value, still it might go to quite an extent toward paying the expense of maintaining the system, especially as the heat produced in the combustion could be utilized for other mechanical purposes, as for instance the boilers to our present system of water works, or for the motive power of the electric lighting plant, or for any stationary mechanical purposes, where heat and steam are required.

There can be evidently no great objection to its presence either to the sense of sight or smell, as these cremators were doing their work near the center of the great "White City," for the five months of the exposition, and

were in constant operation near the Forestry and Anthropological buildings, and multitudes of people were passing and repassing them without being aware of their presence, or discovering even their function by eyes or nose, and with skillful management no doubt it could be operated in any portion of a city, without giving offense or in any way endangering the health of the people.

There is another system known as the "Vienna System," or Mertz Furnace; by this process the garbage is not burned, but subjected to super-heated steam, and dried, the resulting products are afterwards utilized by a process of extraction of fats and oil, and residuum made into fertilizers.

There are a number of cities in this country using them, but I do not know with what results. For cities and villages of from 2,000 to 20,000 inhabitants, it is doubtful if they are as practicable as cremators.

In a paper necessarily limited it is impossible to more than call attention to conditions and offer suggestions when such a large scope of subjects is involved. *Filth means disease*, and how to remove the causes of many of the types have been the object sought. I have tried to show the impracticability of underground sewerage as a system. Charlotte does not possess the natural facilities for such a system. *Incineration is practicable*, but will be, from a pecuniary standpoint, costly.

It is certain that much can be done to improve our present condition, and that too without adding much to taxation. I would earnestly urge that the board of health adopt rules, and if necessary frame ordinances whereby sanitary inspection can be regularly made, so that rules be enforced. Create a board of public works, whereby its members will not all be new ones in each change of administration. Have a plan that will not necessarily be changed each year. Select a competent executive officer for the health department, and regulate the garbage receptacles, and oblige the scavenger to remove it at regular and stated times. This at least can be done, until such time as the people desire the more complete and expensive system.

This done our prairie city will be the more attactive to the eye, and the more desirable as giving more healthful homes.

DISCUSSION OF THE SUBJECT.

SEWERAGE, DRAINAGE AND THE DISPOSAL OF WASTE.

DISCUSSION LED BY PROF. DELOS FALL, M. S., MEMBER OF STATE BOARD OF HEALTH, ALBION.

[Reporter's Abstract.]

I regret very much that the gentleman who was appointed to discuss this paper is not present, and yet the question has been very fully, thoroughly and exhaustively presented in this able paper. I am sure that the citizens of Charlotte will be glad to peruse this paper, after the proceedings of this convention are printed, as they will be.

It is a great question; this question of how to dispose of the waste and excreta. We have gone to almost infinite pains to devise methods by which our life in this world may be made comfortable; that we may pro-

long the struggle for life and existence, in order to improve the ends of our existence, that we may have our due share of enjoyment. It is much better to turn the button and have the house lighted, than to spend a half day in cleaning lamp chimneys. We ought all of us to come into the possession of such luxuries.

But in one direction we have singularly failed to keep anywhere near pace with civilization. We are doing just what the ancients did with our waste and excreta. You will pardon me if I talk plainly. I am not responsible for its being on the program. Draw the picture of what we are doing; what has been going on in this city of Charlotte for the last forty years.

Every man has an ambition to own a house and lot. In a remote part of this lot we make several excavations, three at least; one for the disposal of the kitchen slops, one for the disposal of the human waste and excreta, a third for the reception of the water which we drink. Now notice that of these three receptacles the well is the deepest, and necessarily, from that fact, becomes the one drain into which all the waste deposited upon the soil finally makes its way. We must be cautious about these quantitive statements which are made with reference to the distance from the well where we may safely deposit material. It is not safe to say that a cesspool may be put even one hundred and fifty feet from the well, or that a privy vault may be as near as seventy-five feet. It depends altogether upon the kind of soil and upon many conditions that we cannot see upon the surface, whether it is a safe proceeding to put this material into the soil. It is quite evident that it affords a ready means to the passage of liquid material from place to place. If you picture the real condition of the soil everywhere throughout this city you must all see that it is contaminated, and with it the water in your wells. Now we have been drinking that water all these years. There will be this objection raised. Men and women will say, I have been drinking this water all these years and I am alive and well. That is true. Ordinary organic material does not produce disease and death. It does produce, I have no doubt, a weakened system. That is to say there is a sort of preparation given to us by the constant drinking of contaminated water. But the real danger is a little further on.

The special danger from contaminated water is in the one disease of typhoid fever.

Typhoid fever is produced by that germ that is pictured there in the middle of the chart. Some hold that one germ can not be the cause of all that which we designate as typhoid fever. That there is a specific germ which produces the disease which we call typhoid fever there is no doubt; that passes through the body of the patient that is sick. This excreta is deposited in the privy vault. It finds there a large mass of decaying organic matter which is the proper soil for the growth and development of these germs. They don't die there. These germs are able to go down into the soil with the same liquid material that oozes out from this privy vault. In the event that the typhoid fever germ is deposited into the privy vault, it will make its way through the privy vault into the soil, and finally into the water of the well. That is the story of the communication of typhoid fever from person to person.

I know I have exceeded my five minutes, and I will close now by two or three practical thoughts that come to me as applying themselves to your condition here in Charlotte. The greatest danger is to the people who

are using well water, and my practical advice would be that as far as possible you should abandon the use of the well and drink water from the public supply. I know that we can say in Albion that since the adoption of our water supply, no physician has known of a case of typhoid fever that could in any way be traced to the drinking of water from the public supply. To recur again to our common method of depositing excreta, it seems to me a duty that we should abolish this method that has come down to us from the barbaric ages; this hole in the ground, this open privy vault. And there ought to be courage in this health board as they are constituted by law, to order that at least people who put this material into the ground, should put it where it can go no further than the place which is designed to receive it. This may be done by using cemented vaults. Use some device by which the material which goes into the privy vault may be rendered safer than it otherwise could be. Coal ashes or dry earth has been used upon such material, and in this way the nuisance of smell and sight at least can be removed. And so there is the matter of sewerage, an enterprise for the future, that ought to come to a practical issue in a city like this, a practical idea which is carried out by many cities no larger and no more enterprising than is Charlotte.

I will close by commending again this paper and its many valuable suggestions, and hope that you will read it and act upon it.

Question: You spoke about the cesspool and privy vault and the well as the three excavations. According to that what they call the drive well is unsafe?

Answer: Probably not so much so as the open well.

Question: But you would count the drive well as unsafe would you not?

Answer: Yes; unless the drive well should be pushed so far down so that it would pass through the ground water and into the rock.

Question: In regard to the dry earth instead of coal ashes. Is coal ashes as good as earth?

Answer: I have never been able to find any dry earth that I could manage. I don't believe that it is any better than good coal ashes. Wood ashes are not good for this purpose.

THE RESTRICTION OF SCARLET FEVER AND DIPHTHERIA.

BY WILLIAM PARMETER, A. M., M. D., VERMONTVILLE.

Scarlatina and diphtheria are diseases peculiar to childhood. Of the former, it is said by Murchison that ninety per cent of its deaths occur in persons under ten years of age. It is almost constantly present in every large city in our State.

Diphtheria is not so partial to the young, yet a very large per cent (78) of its fatalities occur in those between the ages of two and ten. A notable immunity from this latter disease is found in nursing children. It is not absolute.

There is, therefore, a reasonable hope that if childhood and youth are protected from these diseases, the maturer years may escape them altogether.

The period of incubation in these diseases, for nearly all cases, lies between one and eight days.

At what time, or how soon after the first symptoms of these diseases appear, will the patient be liable to affect another, I have never been able to ascertain; certain it is that these diseases generate in every patient sufficient of the specific poison, to infect a whole community.

Scarlatina is not liable to recur in the same person. One attack of diphtheria, if not fatal, may be followed by others. Yet I have never known a fatal secondary case. My experience and observation in this matter may have been different from others.

Medical opinion is divided on the question of the absolute specificity of the diphtheritic poison. The claim is set up that it may be, and sometimes is, generated *de novo* from decaying garbage, foul drains and filth in general. I believe no such claim is made for scarlatina. Here there must be an antecedent poison, generated in the body of another person suffering from the same disease. It is moreover true, that, in the case of diphtheria, not only persons but animals also are subject to it, and become sources of infection to others. These poisons may be hidden away in cast-off clothing, carpets, curtains, handkerchiefs, wall paper, etc., where they may retain their virulence for months, or even years. They may be carried about upon the persons and clothing of the well, by domestic animals, by the mails, express companies and by infected articles of freight.

The question now arises—How shall one best restrict and prevent these diseases? In the case of scarlatina absolute immunity can be obtained by absolute isolation. Robinson Crusoe never had the scarlet fever after his shipwreck. But most people cannot secure such isolation as he enjoyed. If the polygenesis of diphtheria is true, the question of immunity from it involves also the avoidance of all filth. This in addition to the precautions against infection from persons and animals suffering from the disease, or going about after recovery loaded with its contagium.

When one considers the constant interchange of persons and commodities; the facilities and facts of rapid intercommunication, the desirability of some other means than isolation alone, to restrict and prevent these communicable diseases is apparent. Elimination, restriction and destruction of the poison itself is at once suggested. Can it be done? In great measure, yes.

Right here it may be well to suggest, that when the poison of these diseases becomes lodged in the system, no known *remedies*, taken either before or after such lodgment can effect their destruction or prevent the development of the disease. In other words:—No *medicines* can give immunity to those exposed to these diseases. It is true that many persons effectually resist the toxic action of these poisons, to which others with no greater exposure succumb. This by an inherent power of resistance of the specific poisons.

I am aware that experiments are now making, which give hope that the diphtheritic poison may be neutralized, or, at least, greatly modified in the body, if the proposed remedy be used prior to, or immediately after, the early symptoms of the disease appear. No such hope is yet in sight regarding scarlatina. It is yet too soon to draw conclusions respecting the value of the new treatment.

A child is exposed to scarlet fever or diphtheria. Within twenty-four hours that child should be isolated from all other children and persons not needed for its own welfare; and should be kept isolated for eight days;

when, if no symptoms of disease have occurred, it may be allowed to go at large.

A child breaks out with a scarlatinal rash in the school room; that room should be vacated for a week, and every pupil in it, certainly those who sit within a radius of six feet from the patient should be isolated from all others for the same time; and the school room should be thoroughly disinfected with burning sulphur, before being again used.

A child is attacked with one of these diseases in the family, among its brothers and sisters. Immediately that child should be placed in a room, (preferably an upper one), as distant as possible from those occupied by the rest of the family. The room should be divested of all furniture, drapery, clothing, carpets, etc., not absolutely necessary to the care and comfort of the patient. No child should be allowed to enter the room during the continuance of the disease, nor until thorough disinfection and airing of the room afterward. During the sickness, all the secretions from the throat, mouth and nose, should either be caught upon rags and immediately burned; or, together with the other excretions and dejecta be first introduced into a vessel containing a strong solution of chloride of zinc, permanganate of potash, or bichloride of mercury, and buried at the farthest practicable distance from any well or spring used for drinking or culinary purposes. The room should be thoroughly aired *all the time*; currents being prevented from striking the patient. The bedding and clothing should be frequently changed, and, before taken from the room should be put in a boiling hot zinc solution made by dissolving ¼ pound of common salt and ½ pound of sulphate of zinc in a pail of water. Now, if the patient be bathed daily, and the skin immediately after be smeared with mutton tallow, or better, cocoa butter, the chances are that but little of the contagium will be communicated to other rooms through the air. The water from the bath should be treated the same as the excretions, and not poured upon the ground or near the water supply. The spoons, dishes, etc., used about the patient should be immediately cleansed in boiling water, in which they should remain till heated as near to 212° as possible. It would be safer still to keep them by themselves for use only by the patient.

When the case is terminated, if all these precautions have been taken, it will be comparatively safe for the other or subsequent occupants of the house, if the room occupied by the patient only be thouroughly disinfected with the fumes of burning sulphur. Of course it is to be understood, that in every case, where it is practicable for the family to vacate the house, every room from cellar to garret should be subjected to the sulphurous fumes for three or four hours; and afterward ventilated by opening all the doors and windows, for as many more hours. It is moreover true that it is difficult and dangerous to the inmates of the house to effectually disinfect one room or a part of the house while the family accupies another part.

The patient, if scarlatinal, when recovered, should still be kept from mingling with others, until all signs of desquamation have disappeared; and the same process of bathing and inunction should be continued. This may occupy a period of six weeks or more in exceptional cases.

If it be a case of diphtheria, then a careful examination of the throat* and glands of the neck by a competent physician will enable him to determine the time when it will be safe for the patient to go at large.

* This properly includes microscopical examination of cultures from the throat; because the germs of diphtheria sometimes remain in the throat weeks after apparent complete recovery.—H. B. B., Secretary State Board of Health.

(Some things that ought not to be done:—)

Burning a little sulphur in the room with the patient, during the illness. It is much easier to kill the patient in this way than the contagium. The use of the vapor of carbolic acid and of chlorinated lime, are objectionable for the same reason.

Perfect cleanliness, thorough ventilation and direct sunlight, combined with cool and equable temperature, are the only safe attainable conditions for limiting the amount of the contagium, consonant with the safety of the patient.

Heat is the best germicide. Fire destroys all disease germs. Wherever a temperature of 250° F. can be maintained for a reasonable time, disease germs are effectually destroyed. As a consequence all infected articles should be subjected to such a heat, if practicable. This can be done only where the means of attaining, maintaining and regulating the heat can be found. For small villages and country districts boiling water, and disinfecting solutions for such articles as will not be injured by them, and fumigations with sulphur for all others, are the only practicable means of disinfecting them.

The details of sulphur fumigation need not be given here; but it may be well to emphasize the fact, that its efficiency depends upon the amount of sulphur consumed relative to the cubic capacity of the rooms, and the rapidity of the combustion. In other words, the density of the vapor, determines in great measure its efficiency.

Where the isolation of the sick from the well in the same family is impracticable, the inmates of the house, should be quarantined.

The least requirement in such a case is that they should not be allowed to enter any room where there are children, or where children are liable to enter soon afterwards, until their persons and garments have been disinfected after the disease has ceased in the house.

Public funerals of those dying from these diseases should not be allowed at any time; nor should the hearse, which is liable to be soon again used at public funerals be employed, unless afterwards disinfected. The hearse is made to carry the dead; it should not also carry Death!

There are many problems arising, in every community during an epidemic of scarlatina or diphtheria which demand the application of correct principles for their solution.

They may be solved by each one for himself, if he remembers that the contagium of these diseases is to be found upon the patient, his attendants, and those casually present; that it is found in the room itself, and probably in all other rooms in the house, with their contents; that it retains its virulence long after recovery; that it is transportable for long distances, by the well, by domestic animals; by the ragman who collects cast-off garments; that it my be shut up in closets and drawers or cling to wall paper or furniture; that children under 10 years are the most liable to attack; and that the only known preventive is avoidance of contact with or proximity to the contagium; that this contagium is destroyed only by high temperatures or by powerful disinfectants; and, that in proportion as these precautions are taken, and these destructive agents employed, is the immunity secured.

DISCUSSION OF THE SUBJECT.

F. A. Weaver, M. D., Charlotte:—This is the subject on which I find on looking over the program, I have been assigned to open discussion: The Restriction and Prevention of Scarlet Fever and Diphtheria. Under the circumstances at this time, I see no reason why very much should be expected from me. The fact is for the past three or four weeks my time has been occupied and my mind engrossed in different ways with sickness and death in my family, and I have had no means other than what my daily practice has afforded me in preparing for this subject. Of all subjects there is none which should receive the attention of the medical profession as should the subject under discussion. It is taking away yearly from the families in our cities, a large per cent. of the young population. It is one of the diseases to which very little attention is given by the householders, and I am sorry to say, by members of our profession. It is difficult to prevent people who are susceptible from taking these diseases when once exposed. I do not think that these diseases should be disposed of as lightly as they are by physicians. Very many times we are likely to give it very little consideration, and at times we will consider that it is unnecessary to have the house placarded. If it is, we have the simple sign "Scarlatina" placed on the door or in front of the house. I think this is a word that as physicians we should try to wipe from our vocabulary. We should not use the term scarlatina. Scarlet fever is the term that should be in front of houses where the disease is known to exist; and all methods of prevention should be enforced.

There are many methods of preventing the spread of these diseases, such as the Doctor mentioned in his paper; the anointing of the little patients with lard and the different oils. But, in scarlet fever, my method has been to use a solution of olive oil and carbolic acid. Anoint the little patients thoroughly with this oil, which will prevent the diffusion of the scales through the atmosphere, and thus lessen exposure.

I would like to dwell at length upon the subject under consideration. But from the fact that I have not had the opportunity to look into the subject as I would wish to have done and which it merits, I will ask your indulgence and beg to be excused.

MILK AND THE MILK-SUPPLY OF THE CITY OF CHARLOTTE.

BY SARA J. ALLEN, M. D., CHARLOTTE.

As a race, the American people have reached a condition of nervous exhaustion which compels a careful study of economics in nerve force, and gastronomics that they may receive the food of highest nutritive value demanding the least expenditure of vital energy in the process of digestion. From a scientific stand-point very little food is required to sustain and lubricate the intricate machinery of the human organism.

For years able men have studied deeply this wonderful mechanism that they might protect or recuperate it from the ravages of disease, but it remained for the last half of the present century to recognize the need

of a liberal, but choice diet of foods easily assimilated to curtail waste and rebuild the nervous tissues, or *centers*—the seat of all disease, and the repair shop for even the accident of the moment which calls for the surgeon's aid; even these must look to nature's great laboratory for healing and do not the nerve-centers preside over this laboratory? The necessity of *proper* food need be no farther discussed; it is apparent.

Milk—our food of "today, yesterday, and forever," must be of such quality, quantity, and condition as to render it admissible to the most delicate as well as the most robust system.

Capable of supplying a larger per cent of building material to *all* the tissues of the system, entering more largely into our curriculum of foods for *all* conditions, it calls for an interest in its *source* and *care*, exceeding any other product, and *doubly* so when we measure its absorbent powers with that of other foods. Milk and its products, cream, butter, and cheese incorporate into themselves as large a per cent of surrounding odors, vapors, or fumes, as they yield to us of their life-giving favors, and unfortunate though it be yield as freely of their acquired poisons.

Milk is most susceptible to odors when colder than the surrounding air, when warmer than the air it gives off its heat to the air which expands driving back the colder element, as it rises, taking with its own vapor the poisonous gases—hence cold air will not contaminate milk, and milk will not be contaminated in the stable so long as it is warmer than the air.

We answer the query, "How then do stable odors get into the milk?" From the breath. The animal breathing in these fumes, they pass over the surface of the lungs, are taken up by the circulation, the blood becomes charged with them, and the milk which serves as a medium for unloading the blood of its impurities as well as its nutriments also becomes loaded with them, thus conveying to the one drinking the milk a supply of germs, inert except in suitable soil. So we find them in many things all unsuspected and so we shall continue to. It is not the fact that they are present, but their *activity* and resulting ptomaines which need alarm us.

Milk is deficient in heat and force giving qualities, but is a perfect diet for the immature. In looking for the source of Cholera Infantum we find the majority locate the trouble in the milk and utensils used in the care of it. We must keep our dishes for setting milk absolutely sweet, and to do so perfectly they should never be used for acid things and thoroughly scalded each time washed, and more than all milk should never be allowed to stand and sour in them. When this accident does occur cleanse them very thoroughly with soap and water, place them well filled with boiling water on the stove and allow them to boil for several minutes, then they will not affect the milk unfavorably. The younger the child, the less active the stomach, and in the young child stomachic digestion is of less importance than intestinal digestion. If the milk is not properly acted upon in the stomach it becomes coagulated and passes on to the instestines improperly hardened thus becoming a source of irritation resulting in a reflex irritation of the brain and a genuine cholera infantum.

Dentition has been considered a fruitful source of diarrhœa but the profession are largely putting this by as a fallacy and look to the condition of the bottle as the source of disturbance. Statistics show that of fatal cases only about three per cent are infants exclusively nursed.

This speaks loudly against feeding. The composition (chemically) of cow's milk is one of the first causes suggested. Chemistry even in the

hands of our modern men and facilities, fails to correct the fault, though it *has* brought us much nearer the human standard. And while our prepared foods claim to be sterile few are found to be so even when first opened.

Dr. Kinne says, "Nine out of ten cases of summer-complaint occurs in the bottle fed babies on milk bought at a dairy."

New Orleans is investigating the cause of so much diphtheria and typhoid fever, and in looking about for the source has gone so far as to request the physicians to inoculate culture tubes (which are left in drug stores or other convenient places) with a few drops of milk supplied the families where these diseases may exist.

As a protection from this formidable bacillus one may sterilize the milk, *i. e.*, bring it to 212° F. for 45 minutes. Pasteurizing milk consists in heating it to 170° for one minute, 158° being necessary to destroy the tubercle bacillus. It has been demonstrated that it is a better food sterilized at a low temperature, say 165 or 170°.

The question of the ticket is to me a far more important question. The custom has been to use for a great length of time or till *worn out*, the same tickets; thus they are used over and over again. At times in the pail or basin, possibly the next in the mouth, and at times used where scarlet fever or diphtheria are present, handled by the convalescing patient during the desquamative stage and the roughened paper readily takes and holds the disease germs.

There are various ways to obviate this; two, easily tried, are the square ticket to punch and the string of small tickets to be separated like street-car tickets.

We find our own supply in good condition. All the dealers sheltering their cows in clean, warm stables, floor so arranged as to prevent soiling to any extent.

Feeding corn fodder with hay and carrots each once a day.

I found no swill feeding among the dealers, that being left to private families. The three keeping their own stock have a large per cent of Jerseys with Holsteins and Durhams. All were looking toward a better Jersey breed.

All dependent on well water, two having windmills, one well having gone dry compelled the use of cistern water.

We found no history of sick cattle, heard no coughs—all in good flesh, a fine looking lot of cows. We purposed to analyze for cream value but were unable to do so. There are three equipped lines; there are one or two others who buy their supply of different parties and this means danger.

The matter of allowing all animal heat to escape before closing the cans is of great importance and was brought to their attention. We wish to impress on the mothers the need of thorough cooling before sterilizing, and the increased danger of tubercular consumption from diseased cows makes it imperative that such care should be exercised when the condition of the cow is not known.

FOURTH SESSION, FRIDAY, NOV. 23, AT 2:00 P. M.

SCHOOL HYGIENE, AS RELATES TO EYES OF PUPILS.

BY PROF. FLEMMING CARROW, M. D., UNIVERSITY OF MICHIGAN, ANN ARBOR.

A very interesting and able address was here given by Doctor Carrow; but, as the address was not in manuscript form, it cannot be here reproduced, however, the following is a brief abstract.

MR. PRESIDENT, LADIES AND GENTLEMEN—I find myself somewhat embarrassed by my surroundings. In the first place I am among a crowd of sanitarians, gentlemen who are engaged in the prevention of disease, whilst I myself am engaged in its management or cure. I am further embarrassed by the fact that last night my colleague, Prof. Vaughan, told the story which I am in the habit of telling myself when I open my address. I am therefore left without a story, except it may be a very dry one, which is about as follows:

A series of experiments and investigations made by me at the State Normal School, Ypsilanti, this last year, the constant and daily studies I am enabled to pursue at the University of Michigan, and the examination of statistics and results have enabled me to reach certain conclusions. Now we will first review school hygiene, in its relation to the eyes of the pupils, and afterwards see if we can suggest the beginning of a better state of affairs in this regard. We will find by a comparison of annual reports of public schools and by consultation with teachers and superintendents, that a large number of children drop out of school between the ages of ten and twelve years. Now, if this occurred later, say between the ages of fifteen and eighteen, it might be accounted for by saying that at this age children can become wage earners and so become a help to their parents. But we must look farther for its cause. Educators will tell us that they drop out of school because they are unable to keep on with their studies.

Very nearly equal results should be reached by the great majority of pupils. If then we have in the same grades at school a very wide departure from the standard, we must conclude either that the general standard is too high, or a very large percentage of our children have some disability. Why should so many children become discouraged? Their hours are comparatively short. In the primary grades they are not expected to study at home. Health of course is an important feature. Many things have their share in handicapping these children, such as the stooping form, eyes bent close to the text. Their effects are daily seen. We now cease to wonder that these children give up the struggle. Yet we talk about the survival of the fittest. But they do fall out of school. Many such children will go home in the afternoon complaining of headache. They are listless and are constantly being corrected. Teachers get impatient, and I don't blame them. The child gets discouraged. We find that the school environment is not of the best. School rooms are imperfectly lighted. This has been brought very prominently to my attention this morning by Prof. Miller, who kindly invited me to look through this High School. The room visited I should judge was 60x50 feet, having an eastern and

southern exposure, in which there are six or seven very small windows; each pane in the window being 10x17 inches, and the window six feet in height, and two feet broad. Now considering the way the windows are placed, through which light may enter such a room, they are altogether out of proportion to the amount of floor space. The instinctive desire to obtain clear vision necessitates an amount of muscular strain upon the eye which makes these children fall out of school after awhile. Many of these school rooms are so situated as regards light that they cannot get direct illumination. This reflected light coming from the surface of a window is a very bad sort of light for our school children. The seating of the pupils at their desks, the character of the desks themselves are in many instances causes of permanent injury to the growing child. The trouble is, the child was not considered when the building was put up.

SCHOOL HYGIENE.

BY PROF. O. L. MILLER, CHARLOTTE.

That the subject assigned me is one of great and far-reaching importance is not questioned by any thinking person. When we consider that school hygiene, if properly understood, would not only lead us to surround the child with healthful conditions but would also furnish the child with a means of warding off many of the ills that beset us on every hand, then do we get nearer to its true meaning and purpose.

As I view it the subject falls naturally into two parts,—the first part setting forth the conditions under which the child should study, the second part concerning itself with the subject matter of instruction.

We are first then to attempt at least a partial answer to the following queries: What constitute the proper conditions with which to surround the child, and how can we best secure these conditions?

We would name the following as the important factors to be considered in the solution of this problem: pure air; pure water; good drainage; plenty of sunshine; proper heating, lighting, and seating of the school room; and finally the rigorous exclusion from school life of all that renders easy and well nigh certain the spread of disease germs.

The first four of these depend to a greater or less degree upon the location of the school building. Good drainage, either natural or artificial, must be secured. Place the building on a slight rise of ground and give the sun a chance to do its part in keeping things pure. The greatest precaution should be taken to insure the water supply from any suspicion of impurity. Especial care must be exercised, if the supply is from wells, that they be situated at least 100 feet from any possible source of danger. Provide free and easy escape for the waste water,—not, however, back into the well.

In passing, it might be well to say that the nerves both of teacher and pupils will be saved much strain, if the school house be placed in a quiet neighborhood, far removed from railroad and other disturbing influences.

A question second to none in importance is that of supplying pure air to the pupil. It must be remembered not only that air is rendered impure by passing through our lungs, but that it may enter our school rooms already freighted with poison caught from adjacent ponds of stagnant

water, from decaying animal or vegetable matter, or from defective drains. Remembering this we get additional hints as to the location of buildings. Either we should shun localities where such nuisances exist or they should be removed. The basement or cellar is too often an unwholesome place. It should be kept clean and thoroughly ventilated.

Ventilation.

Granted then that the external sources of impurities have been removed, the most difficult part of the problem remains to solve. "We may define the purpose of ventilation," says Prof. Langley, "to be this, to supply our dwellings with air having as nearly as possible its maximum purity, and at the same time to remove all noxious materials which the processes of life engender and throw into the atmosphere."

At the outset we are moved to ask whether the air should be brought into the room before or after it has been warmed. Everyone's experience has shown him that, if the air is admitted before warming, drafts and cold floors result. These may not be necessary results, but it is conceded on all hands that better results are more easily obtained in ventilation by connecting it with the heating.

Two principles should guide us in determining the position of the inlets for the fresh warm air and the outlets for the foul air. First, the general movement of the air in the room should be downward, for there is then less danger of impurities floating in the air being drawn into the lungs through the nose at every breath. This may possibly seem trivial. If, however, nature has found it wise to place barriers to dust at the entrances of our bodies, is it not worth while to assist her? This principle leads us to place the outlets at the floor level and the inlets in the side wall several feet from the floor. Two other objects are also accomplished. The inlets do not collect as much dust as they would if placed in the floor. The air is taken from the floor where the air longest in the room and therefore the most impure collects. Second, the air in contact with the windows and outside walls being cooled most rapidly, we should place the outlets near those walls; otherwise currents of cold air may be noticeable near the floor.

We come now to consider the quantity of air needed in a room and how to insure its supply. Those who have studied the matter tell us that about 2,000 cubic feet of air are needed each hour by each pupil. It is then easy to determine the quantity of air needed in a room each hour. Provision must be made for taking from the room an equal quantity of foul air. The rapidity with which air can be withdrawn depends upon the size of the air column and its velocity. We should keep clearly in mind that this problem contains three factors: A definite quantity of air to be removed, size of air column, and velocity of air column. Under no circumstances, in the construction of a building, should an arrangement be allowed which will render it impossible to withdraw this definite amount of air. But as intimated above this will depend upon the velocity and size of the air column. Now the velocity of the air column cannot be varied at will; it depends upon certain well known principles among which may be mentioned the following: The velocity depends upon the difference between the temperature of the column of air and that of the outside air. The velocity depends upon the height of the column. Each right angle in a shaft reduces the velocity one-half. Velocity is influenced by friction

which is relatively greater in small shafts. We conclude then that the size of the shaft is the one element that is wholly and easily within our control.

It is now evident how unsafe it is to conclude that two rooms of the same size are equally well ventilated because we observe that they have inlets and outlets of the same size. The foul air of one may pass directly into the ventilating shaft while that of the other may be conducted many feet and make several turns before it enters the ventilating shaft.

Undoubtedly the most frequently violated and at the same time the most important principle is that the outlets from each room should open into separate ventilating shafts. Adherence to this principle is absolutely essential to satisfactory ventilation. If several rooms ventilate into a common shaft, the moment the equal pressure of air in those rooms it destroyed, as by the opening of a window, that moment there is danger and probability, not only that the foul air from some of those rooms will not be drawn out at the usual rate, but that foul air from this common shaft may be actually forced into some of the rooms. The common ventilating shaft may in this way be the means of spreading disease germs from one room to another.

The air in the ventilating shaft should be kept slightly warmed and for this reason they are best built about the chimney.

Another grevious error in ventilation is an arrangement whereby the cold air is taken from the floor of a room to the furnace, warmed and sent back to the room. We can see how, if the room were carefully aired out after being occupied, such a plan might be harmless if used only before the pupils gathered.

The most efficient system of ventilation in all other respects may be rendered very defective by the closing of inlets and outlets. It is quite generally recognized that the outlets are not to be closed, but it seems to be forgotten that the closing of the inlets cuts off our supply of fresh air. It should be impossible to close the inlets. Protection from too high a temperature should be secured in two ways. First, the janitor should exercise care and judgment in the control of fires. Not precisely as hot a fire should be built on a mild spring day as on a cold winter day. Second, there should exist an arrangement under the control of the teacher, of such a nature that cold fresh air could be admitted directly into the warm air inlet pipe. Thus the volume of fresh air entering the room is not diminished, but its temperature is lowered.

Heating.

In discussing the subject of ventilation we have reached certain conclusions that will guide us in determining the best method of heating. We will at once discard all systems that heat the air after it reaches the room, as that of direct radiation, whether by steam or hot water. For buildings containing several rooms the hot air furnace and steam with indirect radiation are about equally desirable.

For one-room buildings and country schools the furnace is no doubt quite expensive. The common stove can be made to do very effective service. To this end a sheet-iron jacket may be fitted to the back of the stove. The jacket should be from four to six inches from the stove and always closed at the bottom, so that the air in the room will never be reheated and breathed over again. The outdoor air should be brought

in and admitted from below into the space between the stove and jacket. Means must also be provided for the escape of the foul air.

As the subject of lighting has already been treated in this convention, it is omitted from this paper.

Seating.

In seating a school room care should be taken to provide seats that will not force the pupil to take unnatural positions. What we need is an adjustable seat that all may be equally well cared for. Both seat and desk should be of the proper height; they should be constructed with reference to the curves of the human body; the edge of the desk should be just over the edge of the seat. The pupils should be allowed much freedom of movement, but at the same time should not be allowed to take positions which, if persisted in, can only result in deformed bodies, or positions which hinder the organs performing their natural functions.

Contagious Diseases.

With the "Germ Theory of Disease" an established fact and additions to our knowledge of this subject being made daily, it certainly becomes the duty of the school to enquire whether it is doing all it can to reduce to a minimum the danger along this line. Our first thought in this connection is of the slate. Is it not well fitted to harbor and spread the germs of disease? That there are two sides to the question of banishing the slate from the school room must be frankly admitted. We shall not be surprised to see the day when we shall wonder how we so long tolerated the unclean thing.

Again I question whether we are excusable for permitting the use of the drinking cup in common. Germs of diphtheria have actually been found on cups so used. In all such cases it should be determined whether the danger is a real or a fancied one. If real, no consideration of convenience or expense should deter us from taking the right course. If pencils and pens are collected each day a plan should be followed that will secure to each pupil the use of the same pencil or pen every day.

While for many reasons the system of free text books commends itself, we believe it ought to be abandoned for the reason that it offers great facilities for the spread of disease germs.

Assuming that the school has reduced to a minimum the danger of the spread of disease, what course shall be taken when contagious disease actually appears among the school children? The habit of at once closing the public schools and thus, in a very marked degree, interfering with the year's work we believe to be oftentimes unnecessary. Every suspected case of such a disease should be promptly reported, as promptly investigated, and when found to be genuine at once and completely isolated and all infected material completely disinfected. Vigilance should not be relaxed until complete recovery, nor should the child be allowed to mingle with others until all possible danger of communicating the disease is passed, which, be it remembered, often extends a considerable time beyond the period of apparent recovery.

Such careful measures would doubtless require that the local health board be given more funds and be clothed with greater power. But if such vigorous and drastic measures would result in checking the too fre-

quent outbreaks of contagious diseases and thus leave the educational work undisturbed, no one would for a moment question either their wisdom or their economy.

Instruction.

We come now to consider what influence School Hygiene should have upon instruction. If Herbert Spencer speaks truly when he says that that knowledge which subserves direct self-preservation by preventing loss of health is of primary importance, then such knowledge certainly has a place upon our school programs. We believe that many of our schools are already well in line. It remains for those who have not yet recognized the importance of this subject to awaken to the crying need in this direction.

The Michigan State Board of Health have set before them the task of vastly reducing the ravages of consumption, diphtheria and other communicable diseases. Nor is their task hopeless, if they are seconded in their efforts, as the following report shows. In this State in 1890, the average number of cases of diphtheria for every outbreak in which isolation and disinfection were both neglected was 12.70, average number of deaths 2.38. While in all outbreaks in which both isolation and disinfection were enforced, the average number of cases was only 1.50, deaths only 0.33. Do you ask what relation this bears to instruction? Very much. Not until the people generally understand the advantages of such methods, and know how to secure them will they co-operate willingly with the Board of Health. To what institution shall we look to make this knowledge common, if not to the school? In the solution of the problem of intemperance the power of education is recognized. Shall we not also call upon the schools to assist in checking and finally exterminating contagious diseases? The natural place for this work is doubtless in connection with the subject of physiology which is already taught in all the grades.

The limits of this paper have permitted but a brief discussion of some of the problems that our subject presents for solution.

In closing I wish to offer a few comments suggested by a statement in a recent number of the Michigan School Moderator to the effect that in Ingham county a district schoolhouse was being built—" a regular dry goods box with windows. Not half enough lighting, no arrangement for ventilation, blackboards between the windows, old fashioned mischief breeding entries." Then the editor suggests that the county commissioner of schools flood every district, about to build, with circulars on school architecture, that they personally visit and labor with the building committee, endeavoring thus to persuade the district to respect the rights of the children. While this plan may be the best one possible under present circumstances, I submit whether this is not the greater shame that the State stands idly by either impotent or careless to prevent the construction of such buildings. Is it not high time that the sentiment of the State take the form of law that will compel their proper construction? We believe that ignorance is not alone responsible for the unsanitary condition of our public buildings. A false idea of economy is in part the cause. Oftentimes these matters are allowed to go by default. It would seem therefore that one of the objects of such conventions as this, should be the arousing of a public sentiment that will compel the attention and favorable action of our legislature.

GENERAL DISCUSSION.

Prof. Delos Fall, Albion:—Two or three months ago, I had the pleasure of coming to this beautiful city of yours and meeting a little group somewhat smaller than this audience of the citizens of Charlotte, to make preparations for this sanitary convention. It occurred to me that the convention when it came would be a decided success. Now the most decided source of pleasure to us is the fact of so many able papers having been prepared and presented by local talent from this city. And I say this in order to include in that number most certainly the able contribution to this subject of school hygiene that we have just listened to by the superintendent of your schools.

What I shall say this afternoon will be in a precaution hinted at by a remark just at the close of this paper. I am undecided whether to read the paper that I have before me, or to do what I greatly prefer to do, to stand and look you in the face as I talk. I didn't have a Carrow to come to me in my youth and tell me how I ought to use my eyes, and the result is that I have to use this aid to vision across my nose. (Reads paper which follows this discussion.)

Dr. Mary E. Green:—I would like to ask Prof. Miller if the habit of the promiscuous gathering up of the pencils in our public schools in Charlotte is in practice, or is each pupil allowed to retain their own pencils.

Answer:—That is done to some extent. Each pupil retains his own pencil.

Dr. Green:—I visited the school superintendent at one time, and requested the teacher's reason for having these pencils all distributed equally about day after day. Some children who were uncleanly in their habits bit the ends of their pencils. I was informed by one teacher that I was inquiring after that which was none of my business; that my children were no better than anybody else's children. I know at that time that in all the ward schools of this city the pencils were gathered up at the end of each day and put in a basket or receptacle.

Dr. Vaughan told us last night how these germs revel in the dry atmosphere. So that during the winter when the dust is constantly dispersed by the sweeping of the school rooms I think these germs are flying around. I believe that no school building should ever be papered at all. I think the walls should be finished with light paint, and with some color that is agreeable to the eyes. Then the walls should be washed. I believe the floors in all school buildings should be cleaned at least once a month, so that we are killing these germs instead of sweeping them up and sending them about the school buildings. Wash the floors up with some disinfectant, and thereby destroy the germs.

Miss Alice Brown:—It seems that there is one thing that is still worse than that in our schools. The clay has to be gathered up after it has been modeled. For years and years and years we use the same clay. It seems to me that that is worse than the distribution of pencils.

Prof. Fall:—There is another practical point of school hygiene worthy of notice, the common drinking cup. Anyone who is thoughtful about it can see that there is great danger with the common use of one cup for all the scholars. The suggestion which I have to make is this: Teach the pupil not to put the lips on the edge of the cup, but to put both lips into

the liquid of the cup. Thus he don't take directly into the mouth the material that has been left on the edge of the cup by the person who has last used it.

Dr. Mary E Green:—There is a lady behind me that is somewhat embarassed. She thinks that the pupils ought not to exchange chewing gum. I think that is very good.

G. B. Allen, M. D, Charlotte:—Is Dr. Carrow present? I would have liked to have asked him something in regard to his opinion as to the use of blackboards. That is a much vexed question, and I don't think he touched upon that. I would like to ask the question of someone who is competent, the opinion of the general use of blackboards in our schools as they are at present.

———:—I don't think we want to say much about the blackboard.

Prof. Delos Fall, Albion:—I have one idea about that, Mr. Chairman, and I will just do my thinking out loud. The blackboard ought not to be between the windows. The blackboards ought to be, I think, a dead black, with no luster, no polish upon them. The chalk used ought to be of such a nature as to make a broad mark, a prominent mark. There is a good deal of talk about dustless crayon. But I have never yet seen one that was not open to this objection,—it tries the eyes to try to make figures with one of those dustless crayons. Use the chalk that makes a good deal of dust if by that you can get a large mark that is large so that the eye can see it easily across the room.

A PLEA FOR BETTER METHODS OF TEACHING HYGIENE IN THE PUBLIC SCHOOLS.

BY PROF. DELOS FALL, M. S., MEMBER OF THE STATE BOARD OF HEALTH.

When a new discovery is made it is generally the fact that it is so simple, so obvious, so labor saving, so direct in its application, that the wonder is that ingenious and inventive man had been content so long to pursue the old methods in the old laborious way producing so small and unsatisfactory results. The ship-wrecked mariner famished for water for lack of the simple method of distillation by which the salt brine was transformed into potable water; locomotion was slow and tedious because no quick-witted Watt had correctly interpreted and applied the power of steam; it was "stitch, stitch, stitch," with fingers weary and worn, with eyelids heavy and red, a woman sat in unwomanly rags, plying her needle and thread, all because the mind of a Howe or a Wilson had not been opened to the invention of a machine for sewing.

Reforms are slow to take root and inspire a following. Conservatism is the rule and men are not easily moved to see anything good in that which is new. The adoption of the metric system of weights and measures, for example, would save at least a year of intellectual toil for the pupils in our school, who are now compelled to use fully that time in the vain attempt to master the intricacies of our cumbersome system. Its beneficial results in all lines of trade and commerce is also easily demonstrated and yet the progress toward the final universal use of this much needed reform is very slow indeed.

In the same spirit the proposition made by the State Board of Health, early in its history, concerning the contagious character of scarlet fever and the possibility of decreasing its ravages by isolation and disinfection was received. People were slow to believe that there was any efficacy in the newly proposed method of treatment of this disease even though it had in it the promise that many lives of our children might be saved by it. Gradually, however, the teaching was received, the suggestions of the Board were acted upon, and today it can be demonstrated with mathematical accuracy that hundreds of lives are saved each year from this scourge of childhood. In a study of the subject of life saving made by Secretary Baker, some four years ago, he states that statistics and evidence which he had summarized proved that *four* hundred lives are saved every year from scarlet fever. Had the suggestions of the Board on this one subject been promptly acted upon there would be alive today and in full vigor of adult life, many hundreds of persons who were swept into untimely graves.

And still the work of the fell destroyer goes on. Twenty-five per cent of all deaths are those of children under one year of age; forty per cent are of children before reaching the age of five years, and ten per cent are between the school ages of five and twenty. It is with the last-mentioned figure that we desire to deal. If ten per cent of all deaths occur among those who are in attendance at school and if it is true that in the main these die from preventable diseases, then there is great responsibility somewhere, on some one.

I would not charge any large amount of responsibility for the ravages of disease upon the teacher but I do desire to record it as my judgment that no one is in a greater point of vantage from which to set in motion influences which eventually will result in the saving of many lives.

If the State Board of Health today were called upon to characterize in a brief way their efforts to advance the cause of sanitary reform they would boast of what has been called their "campaign of education." Educate the people, enlighten them, and they will act and the work will be done, and I ask what class of people can be so forceful in this campaign of education as the large body of teachers in our public schools? If the children are correctly taught the next generation will witness the carrying out of those teachings in practical life, and the work of sanitary reform will go grandly on.

It will be asked, have not the teachers been teaching the principles of hygiene all these years? They have, but after all their efforts have been largely misdirected, or at least they have not taught what is most important. The teaching of hygiene has heretofore consisted in enforcing wholesome lessons in diet, exercise, the value of pure air and how to obtain it, the evils of contaminated water, improper clothing, et cetera, et cetera. This has all been well, and yet the fact remains that beyond some personal discomfort on the part of those who have transgressed the laws of diet, exercise, etc., no fatal results have resulted. Vital statistics are utterly devoid of any mention or suggestion that any minute fraction of the large mortality among children arises from this direction.

It is a fact that people do not die from the violation of the ordinary laws of living but rather from those extraordinary causes as for example when the germs of some contagious disease are thrust into the system. This being so the direction which our teaching should take is very evident.

And this is the plea that I desire to make, viz.: That there be a radical change made both in the matter and the method of our teaching of so called hygiene or as I prefer to call it sanitary science. Every child in our public schools should be taught the facts concerning the germ theory of disease. He should be taught something of the manner by which investigations are carried on by which is ascertained the true relation which exists between a specific germ and a specific disease. That there is a germ which is well known, by name *Bacillus tuberculosis*, should be as familiarly known as that there are other plants known as *Fragaria vesca* or Cucurbita pepo; and further that it is as certain that when the bacillus tuberculosis is planted in a favorable soil we are just as certain to get a crop of consumption as that planting the seeds of the latter plants we will get a crop of strawberries or pumpkins.

Careful instruction should be given concerning the most commonly occurring diseases, small-pox, consumption, scarlet fever, measles, diphtheria, typhoid fever, whooping-cough, etc., etc. The pupils of our schools should learn the premonitory symptoms, the specific cause, if that be known, the method of spread, the method of prevention, whether isolation or disinfection or both are to be practiced. They should be taught what is meant by isolation and how disinfection is carried on in the sick room, the disinfection of the air, the food, clothing, hands and body of the nurse. They should have a keen appreciation of the precautions which the cautious physician will always take in the case of a communicable disease. The relations of health officer to the sick and to the physician in charge, the duties of the health officers, his powers under the law, and in fact all health laws should be studied in school. Scholars in our schools should be so taught that they will appreciate our vital statistics, and profit by them. These are a few of the subjects which might well be substituted for that which is at present taught under the head of hygiene.

It will be objected that no text-book has yet been written which will make it possible for the teacher to become conversant with these facts. That is quite true, and yet there is a splendid substitute for such a book, and that is in the leaflets and pamphlets published by the State Board of Health. These have been prepared out of the experience of the past twenty years, and teach what is needed to be known about each of the commonly occurring diseases, those which are preventable, in order that an outbreak of such a disease may be confined to the first case.

THE RESTRICTION AND PREVENTION OF TYPHOID FEVER, WITH SPECIAL REFERENCE TO THE GROUND WATER.

BY HENRY B. BAKER, M. D., SECRETARY OF THE STATE BOARD OF HEALTH, LANSING, MICHIGAN.

A little less than forty years ago (March, 1856), Prof. Max von Pettenkofer, of Munich, Bavaria, commenced making systematic observations and records of the depth and oscillations in the depth of the ground water. About eight years later Dr. Buhl compiled the deaths from typhoid fever in the hospitals in Munich, and compared them by months with the oscillations of the ground-water. Still later Wagus charted the deaths from typhoid fever in the whole city of Munich, and compared them with the oscillations of the ground-water, for about twelve years. These comparisons proved that there was a very close relation between the height of the ground-water and the deaths from typhoid fever.

Since about seventeen years ago, systematic observations and records of the oscillations of the ground-water in Michigan have been made, under the auspices of the State Board of Health. These records have, in the main, confirmed the results obtained in Munich, and have added a few important modifications. "We thus reach the conclusion that, in Michigan at least, the relation of the depth of water in wells to typhoid fever is not the same in summer as in winter; that in summer when vegetation is active and not decaying, a lowering of the water is uniformly followed by increased prevalence of typhoid fever; with the advent of colder weather there is a rise in the water-level which is uniformly followed by a decreased prevalence of the fever; that this decrease continues through the winter and spring, even though the level of the well-water is lowered, *provided* the surface of the earth is deeply frozen; that on the contrary, *high* water-level in wells in winter and spring, coincident with ground *not* thoroughly frozen, is followed by *increased* prevalence of the fever. Briefly stated, the typhoid fever follows *low* water in summer, and *high* water at that season of the year when the ground is usually thoroughly frozen." *

I think the explanation of this variation from the rule, which occurs when the ground is frozen, is in the fact that the frozen earth protects the well-water from contamination by leachings from privies and other sources of danger.

The true explanation of the rule that typhoid fever is generally increased by a lowering of the water in wells is, I think, that the impure contents of wells are then more condensed, a wider area is drained by each well, and the contents of more privies then leach into each well.

Typhoid fever is a disease caused by germs which find their home in the human intestines. And the disease is spread by these germs which find their way from the contents of the intestines of one person into the

* Proceedings Sanitary Convention, East Saginaw, Mich., Dec., 1894, p. 25.

"CHART I.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS before, during, and since the INTRODUCTION of SEWERAGE and WATER-SUPPLY.

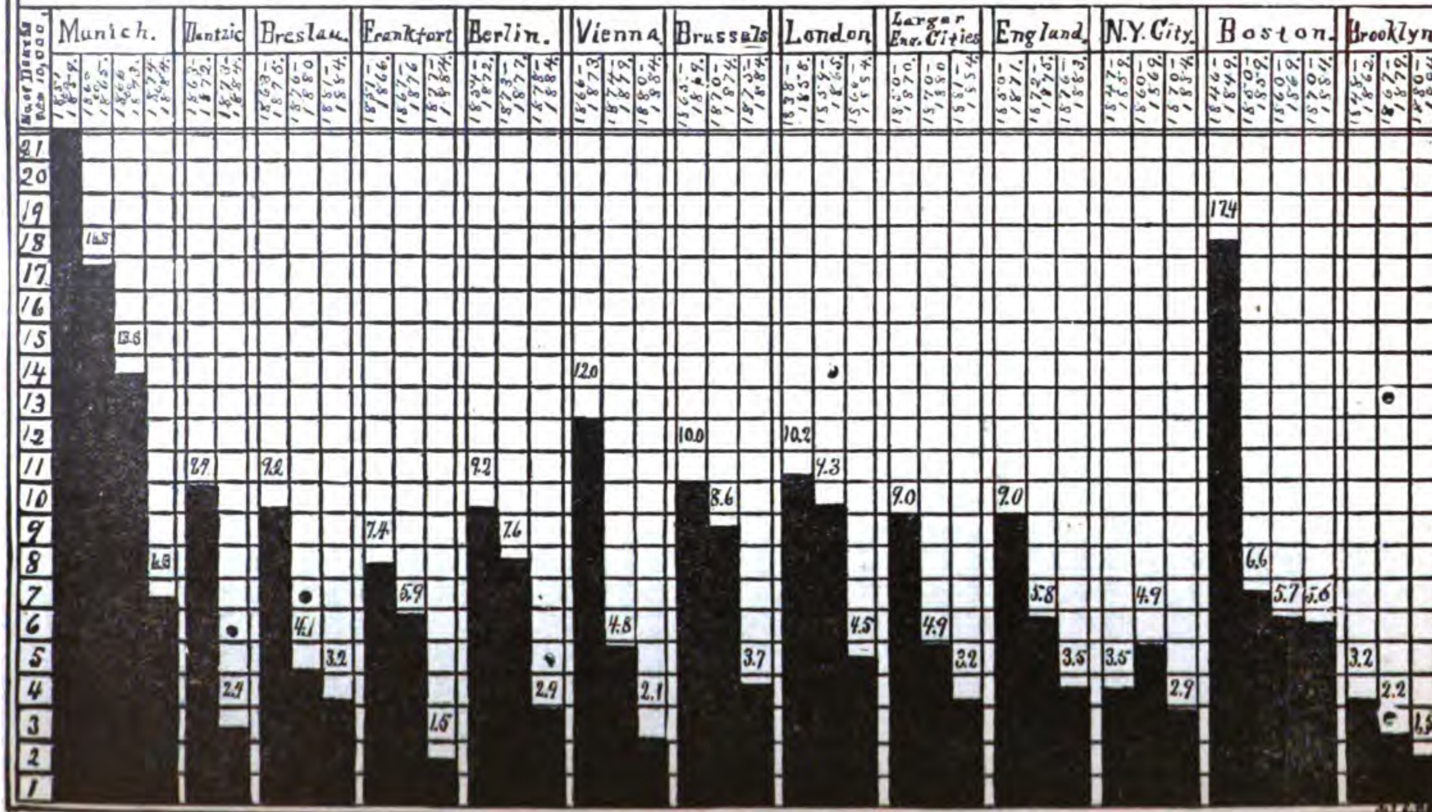
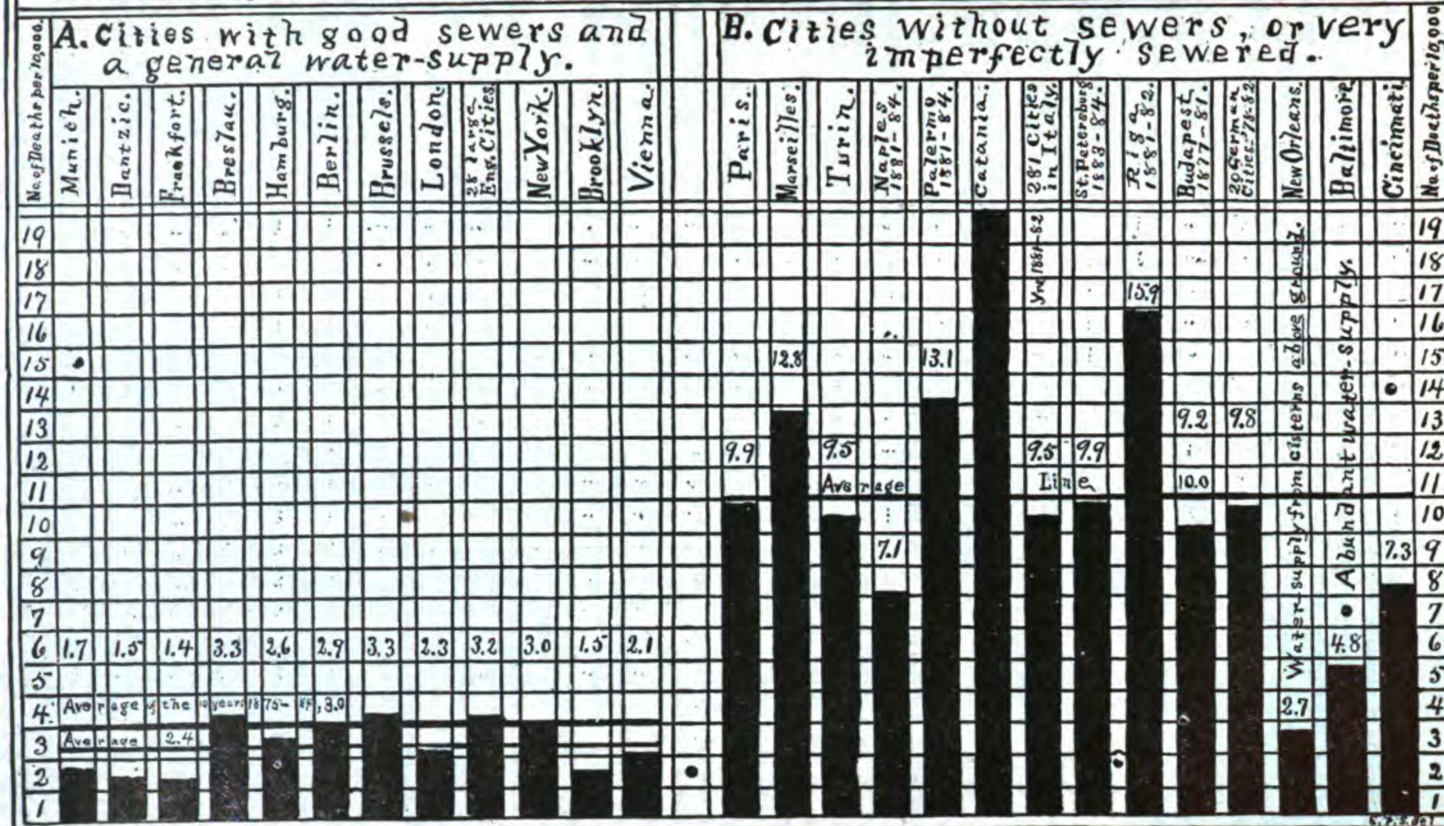


CHART II.— DEATHS from TYPHOID FEVER to each 10,000 INHABITANTS in SEWERED and UN-SEWERED CITIES. Av. of 5 yrs., 1880-84,—unless otherwise stated.



intestines of other persons. That is the belief of sanitarians to-day. There is a possibility that typhoid fever may be caused by the ordinary germs in the large intestine being carried into the small intestine of the same individual; but even if this shall be found to be true, probably this is most frequently done by means of contaminated drinking water. Some of the evidence of the relation of typhoid fever to impure drinking water is as follows:—

Chart I. (page 94), distributed in this audience, exhibits the deaths from typhoid fever in several cities in this country, and in other countries, before and after the introduction of sewerage and water supply. It is plain to be seen that a great reduction of typhoid occurred.

Chart II. (page 95), exhibits the deaths from typhoid fever in cities with good sewers and a general water supply, compared with cities without sewers. Cities without sewers, and using water from wells, have a large mortality from typhoid fever.

I have here a diagram (page 97), and copies of it have been distributed to you, in which is shown a summary of the experience in 313 cities without sewers, and in 39 with sewerage; also in the city of Munich, the home of Prof. Max von Pettenkofer.

Here is a diagram (page 99) exhibiting a representation of the germ which is alleged to cause typhoid fever. (It is "No. 3" on the leaflet.) I think it is well for every one to form a good mental image of the specific cause of each disease. It is then easier to act intelligently for the restriction of that disease.

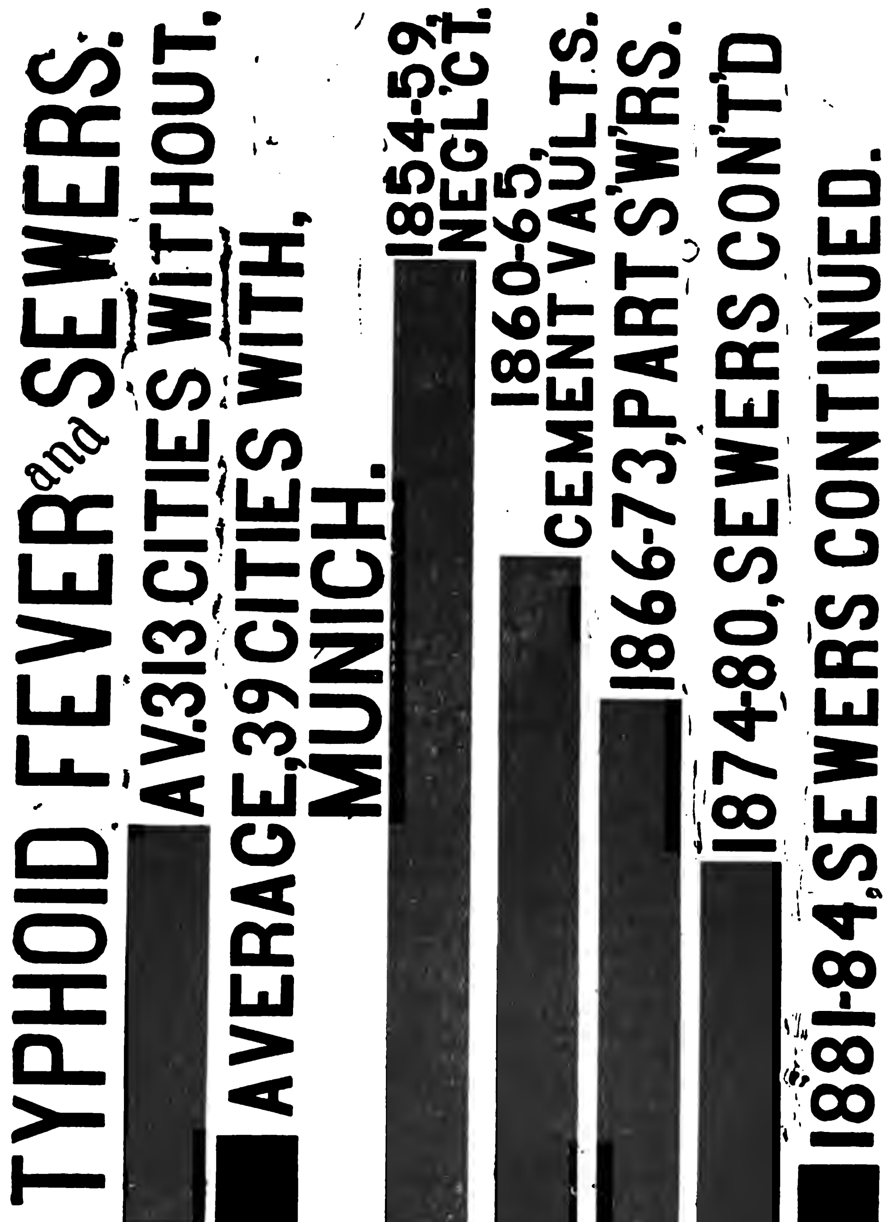
On the reverse side of the same leaflet p. 98 is a diagram exhibiting the relative importance of typhoid fever as a cause of deaths in Michigan. It is one of the most important causes of deaths. It is believed that in every year a thousand persons die and ten thousand are sick in Michigan from typhoid fever. A thousand persons die mostly from drinking water which has drained through privy vaults! Villages and small cities which have no good general water-supply, but rely upon wells for drinking water, are especially the places which suffer most. In such places the proper course is to drink no water until after it has been boiled.

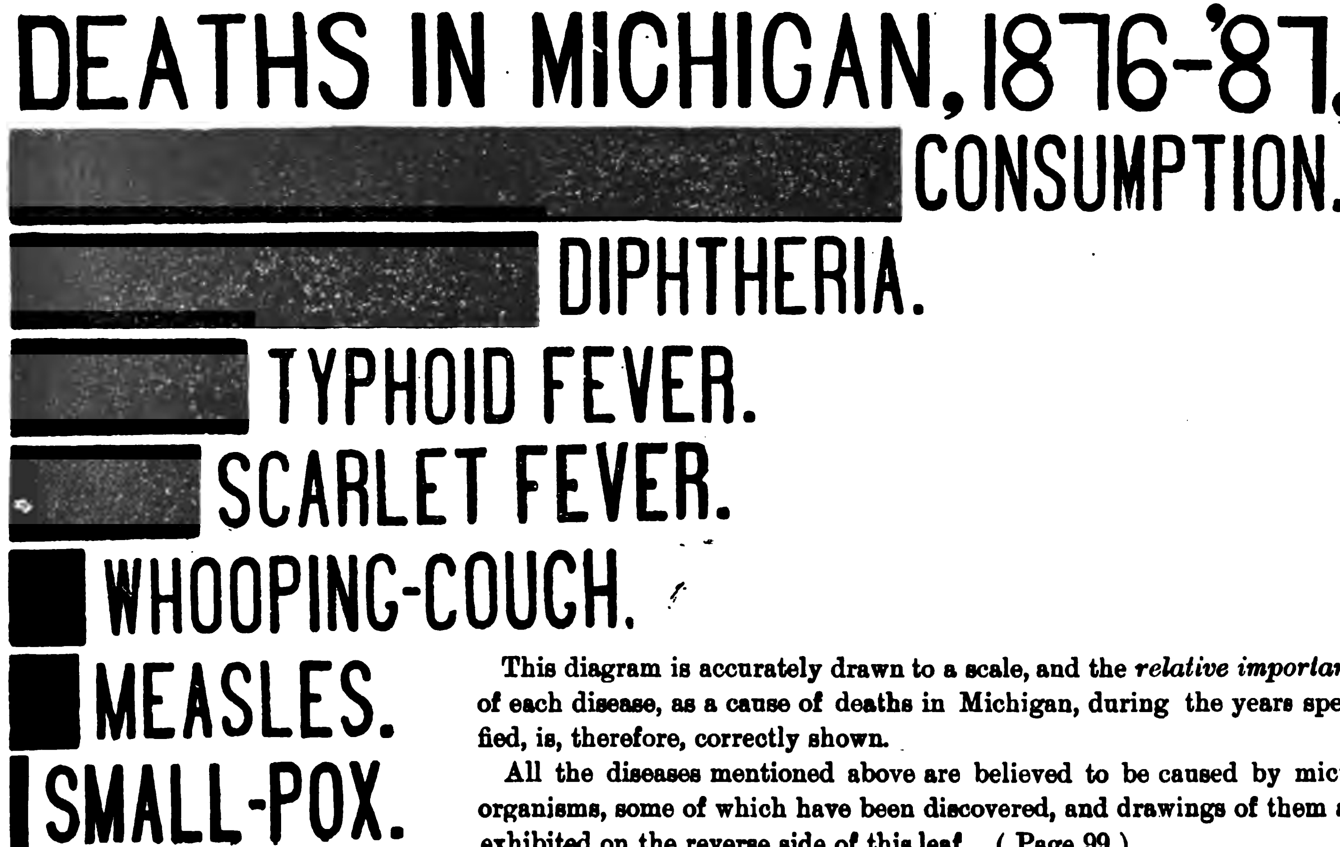
Here is a diagram (pages 100–101) ("Isolation and Disinfection restrict Typhoid Fever") tending to prove that isolation and disinfection, including the disinfection of the bowel discharges of those sick, restrict typhoid fever. On one side is the experience in Michigan in 1890, and on the other is the experience in 1891.

Here is a diagram, (page 104) the last two columns in which, exhibit the reduction in the death-rate in Michigan from typhoid fever since the efforts have been made by the State Board of Health to restrict that disease. The work began in 1879, since which, according to the statistics, up to and including the year 1890, 1,671 persons have lived who under the previous death-rate would have died from typhoid fever.

Typhoid Fever, Sewers and Water-Supplies.—In the diagram below, the first line represents the deaths from typhoid fever in 313 cities *without* sewers. The next line shows the deaths from typhoid fever in 39 cities *with* efficient sewerage. The reduction in typhoid fever after sewerage is great; but it is not all due to sewers; it is due greatly to the comparative purity of the general water supply, introduced when the sewers are, and partly to the lessened impurity of the water in the wells used after sewers are constructed. In the lower half of the diagram, the upper line represents the death-rate from typhoid fever in Munich, Bavaria, when the inhabitants drank water from wells, and the excreta were stored in ordinary privy-vaults; the death-rate was then 24.2 per 10,000 inhabitants. In 1860 the city required the cementing of the vaults; the second line shows the reduction in the fever. In 1866–73 the city com-

menced a system of sewers; the third line shows another reduction. In 1874–80 the sewers were continued; the fourth line shows that the reduction continued. In 1881–84 the sewers were further continued; and the lower line shows the deaths greatly reduced. In 1884 the deaths from the fever were reduced to 1.4 per 10,000 inhabitants. That is, when the people of Munich drank water from wells which drained the privy-vaults, the death-rate from typhoid fever was about seventeen times as great as it was after the city was well-sewered and had a good general water-supply.

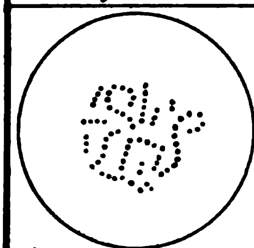




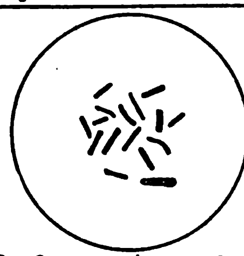
This diagram is accurately drawn to a scale, and the *relative importance* of each disease, as a cause of deaths in Michigan, during the years specified, is, therefore, correctly shown.

All the diseases mentioned above are believed to be caused by micro-organisms, some of which have been discovered, and drawings of them are exhibited on the reverse side of this leaf. (Page 99.)

Various Forms of Bacteria supposed to cause Diseases.
(Copied from Dr. Carl Friedlander's "Manual of Microscopical Technology.")
In Figures 1 to 9 magnified 1000 diameters.
In Figure 10 magnified 600 diameters.

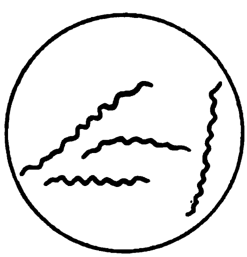


1. Pyæmia. Micrococci from pus.

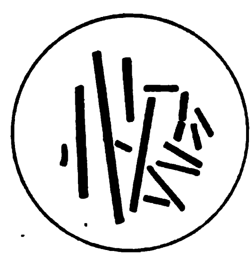


2. Consumption. Bacilli from miliary tubercle. One contains Spores.

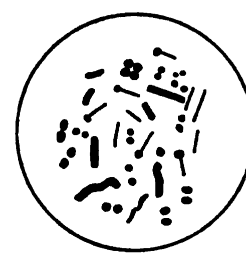
3. Typhoid fever. Bacilli from Peyer's patch. All contain Spores.



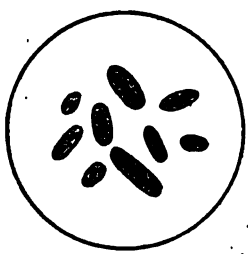
4. Relapsing Fever. Spirilla from the blood.



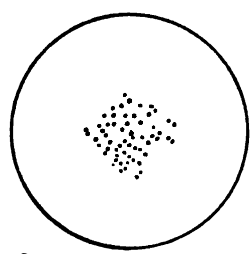
5. Anthrax (Malignant pustule). Bacilli from the blood.



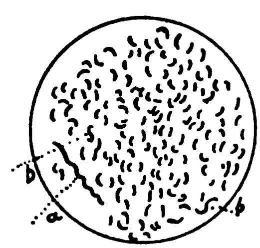
6. Various forms of bacteria found in the Saliva.



8. Pneumonia. Capsulated micrococci.



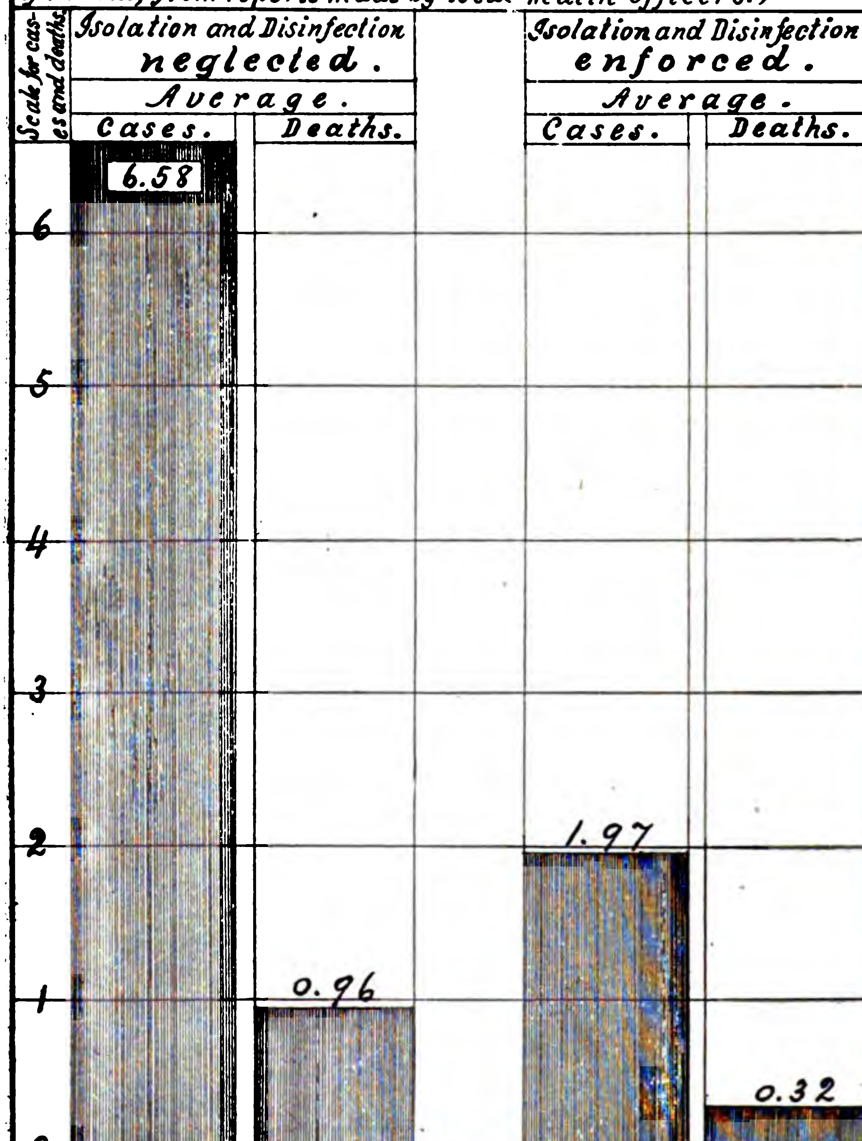
9. Erysipelas. Micrococci from the skin.



10. Asiatic Cholera. Comma-bacilli, a Joined to form threads; b The S shaped forms.

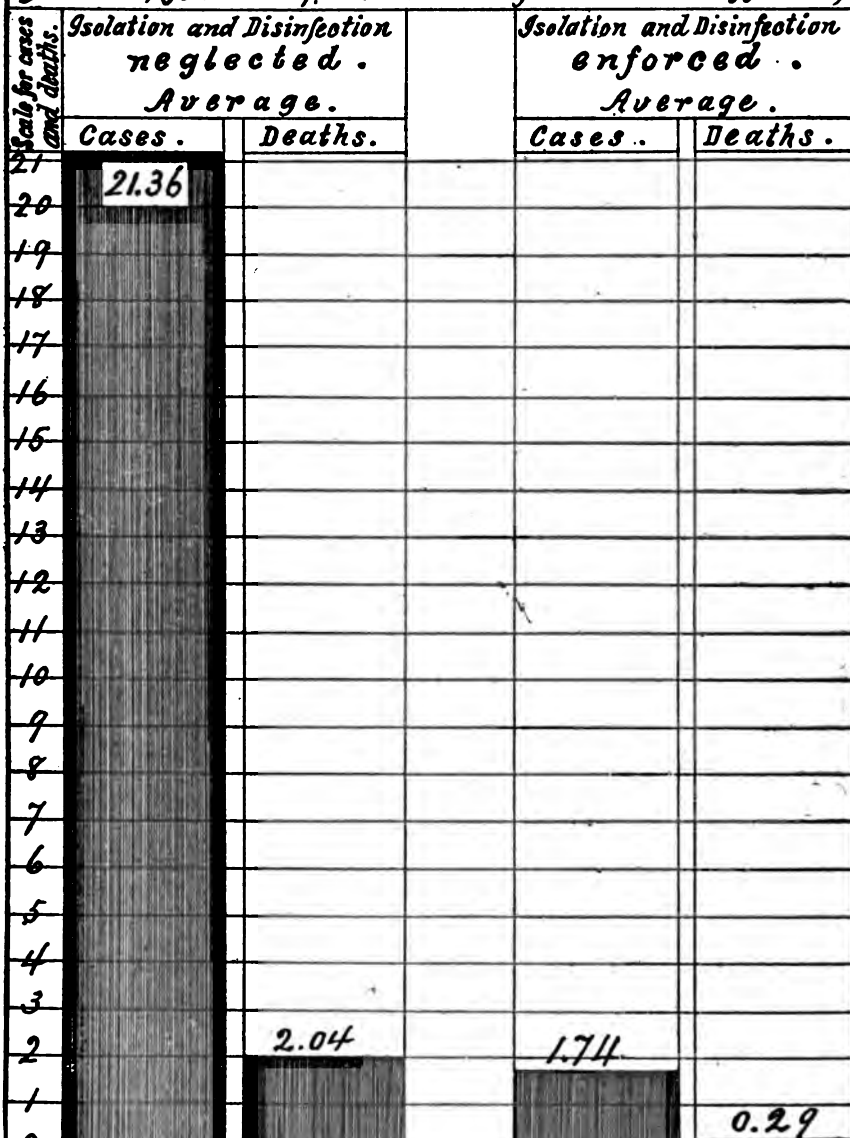
Prepared to illustrate "History of investigations Concerning Micro-Organisms." By Mr. Frank Wells.

*Typhoid Fever in Michigan in 1890:—Exhibiting the average numbers of cases and deaths per outbreak:—in all outbreaks in which Isolation and Disinfection were both neglected; and in all outbreaks in which both were enforced.** (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)



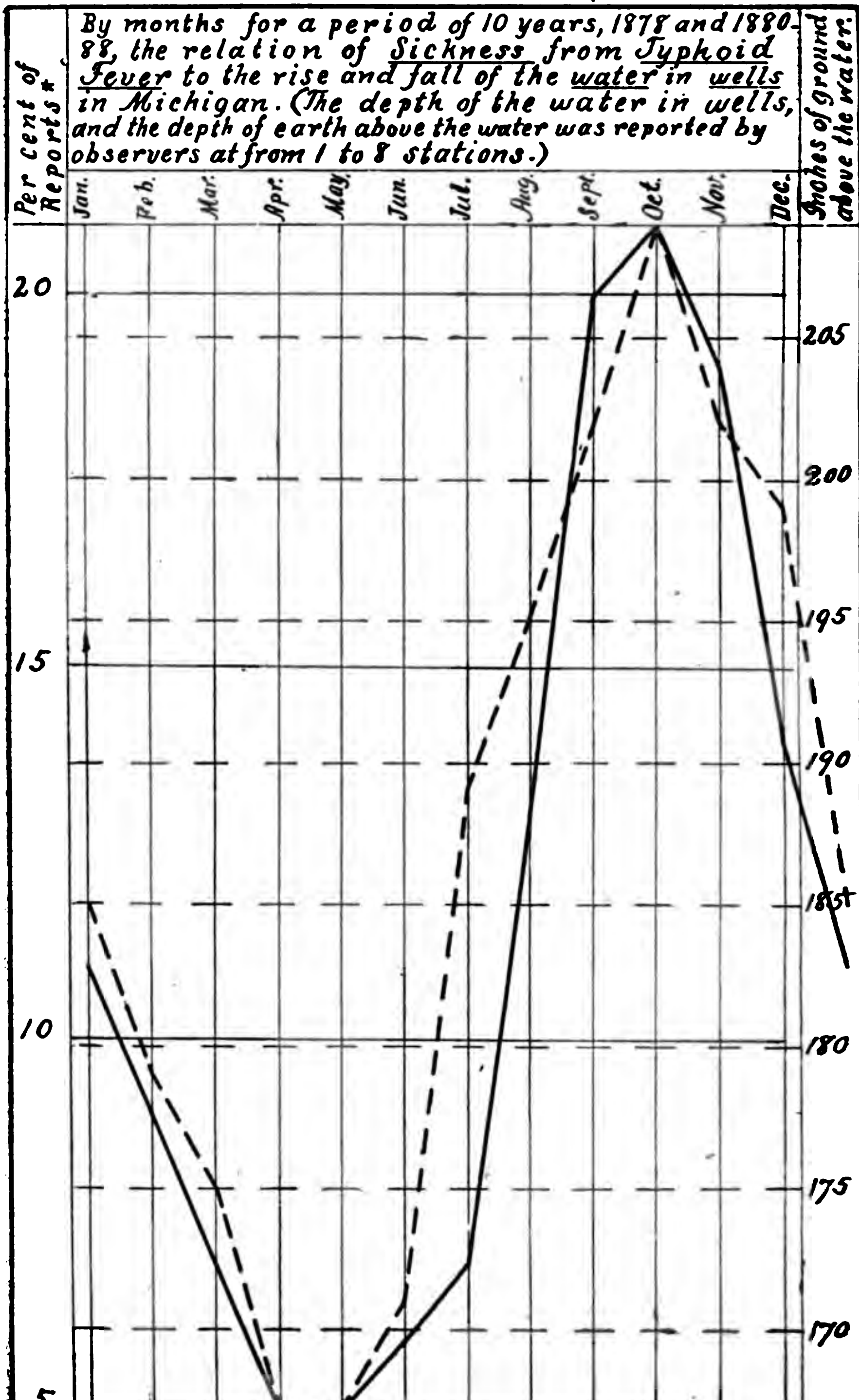
**Including the disinfection of the bowel discharges of the patients.*

Typhoid Fever in Michigan in 1891:- Exhibiting the Average numbers of cases and deaths per outbreak:- in all outbreaks in which Isolation and Disinfection were both neglected, and in all outbreaks in which both were enforced. (Compiled in the office of the Secretary of the State Board of Health, from reports made by local health officers.)*



**Including the disinfection of the bowel discharges of the patients.*

LOW WATER IN WELLS AND SICKNESS FROM TYPHOID FEVER IN MICH.



Sickness ——————. Ground Water — — — — — —.

*Which stated the presence of Typhoid Fever.

Returning now to the subject of low water in wells, the chief use to be made of the knowledge of the relation of typhoid fever and low water in wells is as a warning to the people of their danger.* And the warning is useful only when people give attention to it. This autumn has been a time of unusual danger, and warnings to the people were issued from the office of the State Board of Health. A copy of one is here distributed. It is as follows:—(It was issued in September.)

"BEWARE! UNUSUAL DANGER NOW FROM TYPHOID FEVER, BECAUSE OF DROUTH.

The water in the well* last September was three inches *more* than the average of previous years; this September it is four inches *less* than the average. For the second week in September, typhoid fever is reported from 18 places more this year than last year. More people should boil their drinking water; and all should be more careful not to breathe, or take in on fruit, celery, or other uncooked article any dust from dried human excreta, that substance being usually the cause of typhoid fever. The danger usually culminates in October.

"OFFICE OF THE SECRETARY,
STATE BOARD OF HEALTH,
Lansing, Mich., Sept. 19, 1894.

HENRY B. BAKER,
Secretary."

*A representative well near the center of the state.

The danger of typhoid still continues, as may be seen by the following statements:—

In October 1894, there was five inches *less* water in the well, than in September, 1894; eleven inches *less* than in October, 1893, and seven inches *less* than the average for October in the eight years, 1886–1893.

In September; 1894, typhoid fever was reported present at one hundred and twenty-one places in Michigan, an increase of thirty-nine places over the preceding month, and forty-six more places than in September, 1893.

In October, 1894, typhoid fever was reported present at one hundred and sixty-five places, an increase of forty-four places over the preceding month, and fifty-six more places than in October, 1893.

In October, 1894, typhoid fever was reported present by twenty-six per cent. of the weekly card reports; this is forty-four per cent. above the average for October in the eight years, 1886–1893.

In this month, November, 1894, there was eight inches *less* water in the well than in October, 1894; fourteen inches *less* than in November, 1893, and thirteen inches *less* than the average for November in the eight years, 1886–1893.

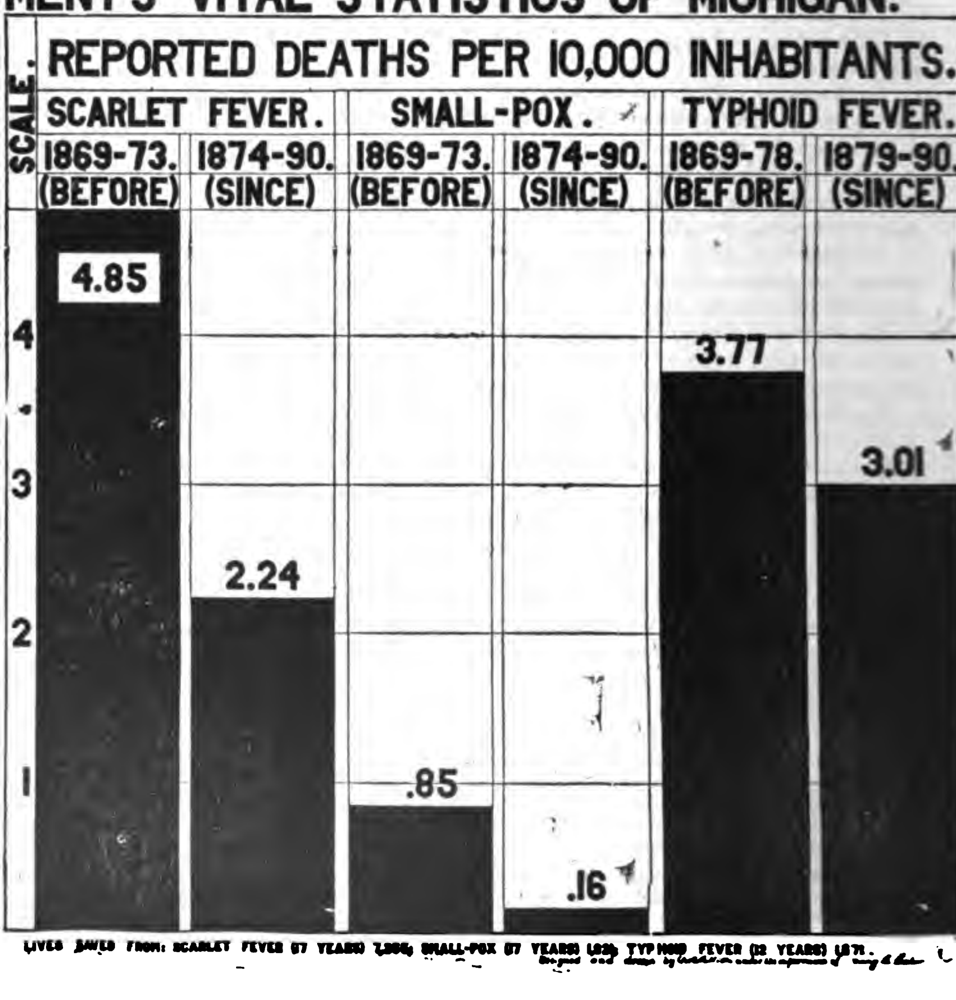
The observations on this one representative well would indicate that this year the danger from typhoid fever was to culminate later than in October; but I am glad to be able to state that the reports throughout the State to the State Board of Health indicate that it culminated in the week ending November 10, and that in the week ending November 17, there was a marked reduction in the typhoid fever in Michigan.†

However, there is still a great deal of typhoid fever in Michigan, and every person will do well to have this in mind, especially in every place where the water-supply is derived from a well. There the watch word should be: *Boil your drinking water.*

* NOTE.—The danger from typhoid fever appears to be greatest in October, when the water in wells is lowest, that is, when there are the most "Inches of earth above the ground-water." The danger is least in May, when the ground-water in wells is highest. See diagram on page 102.

† The reason why the well at Lansing showed such a continued lowering of the water the middle of November 1894 is, probably, because of the fact that the rains were very small in quantity, and the grounds in the vicinity of the well are under-drained, so that in time of drouth small rainfalls do not reach this well as freely as they do the average wells about the State.

LIVES SAVED BY PUBLIC-HEALTH WORK. COMPARISON OF DEATH-RATES IN MICHIGAN FROM SCARLET FEVER AND SMALL-POX BEFORE AND SINCE THE STATE BOARD OF HEALTH WAS ESTABLISHED AND FROM TYPHOID FEVER BEFORE AND SINCE ITS RESTRICTION WAS UNDERTAKEN BY THE STATE BOARD. COMPILED FROM STATE DEPARTMENT'S "VITAL STATISTICS" OF MICHIGAN.



LIVES SAVED FROM: SCARLET FEVER (17 YEARS) [illegible]; SMALL-POX (17 YEARS) [illegible]; TYPHOID FEVER (12 YEARS) 1,871.

FIFTH SESSION, FRIDAY, NOV. 23, 1894? AT 7:00 P. M.

SANITARY CONDITION OF JAILS AND POORHOUSES.

BY JUDGE CLEMENT SMITH, HASTINGS.

I have been greatly interested in the sessions of this convention, and I feel that much, very much, good must result from it. It is not only a pleasure to me to meet so many whom I know, and so many who have been more than friends to me, but also a pleasure to contribute in a small measure, to the helpfulness which it is hoped this convention may bring to those who attend it.

Many years ago, in my own little city, a convention of this nature was held, and left with us most beneficial results, not so much in the specific suggestions which were made, to which some here and there became attached and which they used to bolster up some pet hobby or theory to the discomfort of those around them, but in the increase of general intelligence and common sense about the every day affairs of the household and city generally. The effects of that convention are with us yet, and I trust they will remain for years to come.

The papers thus far given us have pertained in the main to the homes we have and to the school room institutions, with which we are familiar in our every day life, but I am to address you regarding two institutions, which the general public know but little about, and if I succeed in getting you interested in them, more than in the past, I shall have accomplished what was intended by me in preparing this paper.

I cannot theorize. The topic is not susceptible of that, but I can in a general way, make some suggestions which I trust will lead you to think of the topic. And were I permitted to get away from the subject itself and treat of these institutions, and especially jails, in a general way, I know that you would agree with me in some of the propositions regarding their management.

The subject assigned me is one of importance, and should receive from the people at large, very much more consideration than is usually given it.

As a rule, the general public shrink from contact with jails and poorhouses, and to that extent, that it knows but little about their management, control and necessities, but when we take into consideration, that in every county in the State there is a jail and a county house, in which a certain per cent of the population, of necessity must stay, if we are the humanitarians we profess to be, if we follow closely the teaching of the Great Gallilean, we must be interested in these unfortunates, and I can look upon them only as unfortunates.

As to the inmates of poorhouses, there can be no question that they are unfortunate. It is misfortune of some kind, that brings one there, as an inmate. No one, unless an imbecile or bordering close to imbecility, goes there freely. On the contrary, they go there unwillingly.

It is the promtings of humanity, born somewhat of necessity that the public cares for them.

However much we shrink from making ourselves acquainted with the inmates of poorhouses or their treatment, we should not forget that these houses are occupied by unfortunate human beings, men and women with souls, and many times men and women with delicate sensibilities, and who have lived in the past in their joys and sorrows, doubts and fears as we have lived, but through sickness, mismanagement or misfortune have sung the song:

"Over the hill to the poorhouse I'm trudging my weary way."

I never visit one of these institutions without leaving it, feeling more kindly toward my fellow men, and more thankful that He who created us and who has given us so much that makes life pleasant, has also built into the thought of civilized community that benevolence that cares for these unfortunates.

In my judgment, inmates of jails should also be classed as unfortunates, and they are more apt to come out and go among us again, than are the inmates of the county house, and for that reason we are interested that they be put in the condition to become good citizens, if possible to do so.

I think I am not at all troubled with that unhealthy sentimentalism, that sometimes breaks out regarding prisoners, yet I believe in their being cared for in such a manner as to reclaim them and bring them back to respectable and helpful society again, if possible to do so, and I believe this is better and more quickly done by treating them as law breakers, so far as their confinement is concerned, but insisting that they observe those rules that conduce to their health, of which I shall soon speak.

Too many jails are managed upon the sickly plan of pandering to the tastes and habits of those confined there. It is high time that it be demanded that these men be permitted to have those things necessary for their comfort and health, and no more. The furnishing of prisons with bad literature and worse tobacco, is not, in my judgment, conducive to their best interests, or the best interests of the public.

A jail, at best, is a sombre, gloomy place; it is a place for very severe meditation and thought to one possessing average intelligence, but as conducted in many places, it is a hot-bed for the propagation and concocting of crime.

When we fully take into consideration what a jail means and what it is for, we are the better able to do for its inmates those things which ought to be done to bring about the ends for which punishment is meted out.

An inscription on an old prison of Edinburgh, says:

"A prison is a house of care,
A place where none can thrive,
A touchstone true to try a friend,
A grave for men alive.
Sometimes a place of right,
Sometimes a place of wrong,
Sometimes a place of rogues and thieves,
And honest men among."

There is a wide field for any one disposed to have his neighbor's good at heart, in those two institutions, the jail and the poorhouse, and the public who are the most interested must not forget its rights, in the manner of their maintenance.

There is as much difference in the management of the county houses and the jails as there is in the homes of our people.

The requisites which ought to be insisted on in their management is *cleanliness, good ventilation, pure water and wholesome food.*

It will not be disputed that the lack of these in a home soon brings disaster. If this be true, when one can meet friends, go and come when he pleases, get away from the impurities of the air at times, in other words can rid himself of uncleanliness, bad ventilation, unwholesome food and water, and yet sooner or later breaks down, because of them at other times, how much more true is it of those who are confined with these impurities all the time.

It must not be forgotten that these institutions many times have many people in them, and the more there are the more the necessity for the most careful management.

I have been in these places, where the impurities were so great, as to upset me for a full day, and the thought of them was unpleasant for days at a time.

I believe prisoners think better, when clean and free from filthy habits.

I believe prisoners have purer thoughts, if surrounded with good air, eat well cooked food, and are clean in body and clothes.

This will not be disputed, and if not, then it cannot be disputed that the more a person has of these elements, even though confined in a jail or poorhouse, the more apt will he be, to rise above them, and when the opportunity offers, so conduct himself that these places will not be his abode.

I visited a jail not long ago in which the filth and disorder was not only disgraceful, but made one heartsick to think of it, and there were in it enough able-bodied men to have kept it clean and neat. How much better the occupants would have been, had they been kept busy at this work, instead of passing away their time in smoking and chewing tobacco and spitting wherever it came convenient when occasion required, and in reading the literature so often found in jails, which would be far better for the general public, were it in the furnace to heat the rooms for the warmth of the body, rather than to heat the brain and thought for more desperate deeds when the term of imprisonment should cease.

All jails are not thus kept, and did the general public visit them more, less would be kept that way than now.

I call to mind one visited a few days ago, which very closely approached my ideal of what a jail should be.

Its occupants understood that it must be kept clean and neat, and that they must do it. They were well fed, not richly fed, but had wholesome food, well cooked. In keeping the jail clean they had exercise that did them no harm, on the contrary was a positive help to them.

Need I make any argument as to which place the occupant would come from with better thoughts, and with brighter hopes and better resolutions to be a man.

Any person who has had any knowledge or experience in the matter, knows full well, that dirt and filth, lived in all the time, night and day, brings forth in due time weak minds, weak bodies, and these in turn bad minds and bad thoughts and bad persons.

I am a firm believer in the beneficient effects of the Sunday School. I believe it is the place for every boy and girl, be they little or in their teens, I believe it is the place for every young man and woman, and now being in middle age, I recommend it to the middle aged, and I hope when I become old in body I shall still be in the Sunday School and yet feeling

that it is a grand, good place to be, but I believe some of its beneficent results grow out of the fact of the cleanliness which one is driven to in order to be a happy attendant in them, and sometimes when I look over a school, I say to myself, would these, all these, be as clean and neat were there no Sunday Schools, and thank God for them.

Great advances have been made in later years in the management of these institutions, but in many of them, and perhaps in all of them, there is much room for more. We as the public, in view of the bad effects of bad air, unwholesome food and filthy rooms upon those who are compelled to live in them have a right, and it is our duty to see that these institutions are managed in a humane way.

It is true that the law provides for visitations to these institutions from year to year, but it is too frequently the case that these visits are the occasions of a dinner for the visiting board, who have sent a note of warning time enough before the visit is made, to have all things ready.

No institution in the county requires better men and women for their care and management than do the jails and poorhouses, and when I say women I mean it, nor do I speak *pro forma* or to gain the approval of the sex, but because I know the needs of these institutions.

A sensible, methodical, kind hearted, but firm Christian woman in a county house is the soul of its management, however good her husband may be, and in a jail her influence would be far reaching, and in both institutions she would see many necessary things to be done, that the best and most observing man would not notice or think of, and I give no other reason for it, only that she is a woman.

The guardians of these unfortunates should be selected with care, and no one of doubtful habits or doubtful morals should be placed in control of them.

Not long ago I made a visit to a county house. I went with a party who had had much experience in the management of them. There was no knowledge that our visit was to be made, and although reaching the place early in the day, yet we found everything in the best of order, and this family of unfortunates, numbering upwards of fifty were as well cared for as they could be. The rooms and halls were as neat and clean as could be asked. The inmates were dressed in clean clothing, and I came away feeling that these unfortunates could not have come into better hands, as public dependents. The matron of the institution was the soul of it. A woman upwards of fifty, with one of the kindest faces I ever saw, moved among these people, entitled, by her firmness and good judgment to their love and respect, and it seemed to me she had it in a good measure.

The good influence exerted by her and her husband can never be lost, but it is the influence that every place of its kind should have.

And now to recapitulate, what we need to take charge of these institutions is the best men and women we have. Such men and women will the more surely carry out and enforce the suggestions made in this paper. We want the best results that can be obtained from these institutions. It is our right as citizens, and if the general public would interest themselves in the future, more than they have in the past, we would see such results as would show the worth of the effort.

Could we bring about this needed reform in the management of these institutions, I most firmly believe that it would have a most beneficial effect upon other evils, not treated of in this paper and which could not be covered in a paper upon this topic, because I believe that if the body and

mind could be cared for in the way suggested the elevating influence would be felt in the entire make up of the inmates of these institutions.

DISCUSSION OF THE SUBJECT.

Prof. Delos Fall, Albion: It seems to me that this paper and its presentation ought not to pass without some word of discussion of this most important subject. And if it will give time for some of my brothers here to gather a little courage so that they may enter fully into the discussion, I will be willing to sacrifice myself in that way.

I believe that we have heard introduced into this convention a thought which is a valuable one, although it is a little out of the usual beaten track of the sanitary convention. We are too much engaged, I am afraid, in the thought of ourselves and our getting there; and the Judge's paper has compelled us to thrust out our thought away from ourselves into a place that is but little known about, a place that we all hope to escape from, never expect to go there, at least hope that we never shall. A man is not as strong to resist temptation when he is tired as when he is rested. If thought is raised no higher than a game of cards and the gambling idea that goes with them, he is much more ready to enter into a life of crime than he is when his body is clean and his heart lifted into a pure atmosphere, as has been suggested by this paper. I am very glad that this paper will be read in the printed form. I feel like thanking Judge Smith for coming here today out of a busy life and devoting his time and interest to this sanitary convention, and contributing so much that is valuable in this paper.

William Parmeter, M. D., Vermontville:—It seems to me that one thing that we want to look at, and which lies at the bottom perhaps of the unsanitary condition of our jails, is that our jailers universally, I think, in this city and perhaps in all others in the United States, are professional office seekers. We lack men as sheriffs, and they are the men that are selected by the political brothers for that business, without any regard for their fitness for sheriffs but with regard to their ability to get there on the ticket. Now it seems to me that if we are going to have a reformation in our jails, the care of the jails should not be in the hands of the men who are elected by political partisanship.

J. M. C. Smith, Charlotte:—I didn't think when I listened to the very interesting paper that was presented this evening and instructive lessons promulgated that there was room for anything to be said outside of the paper itself.

It seems to me that the gentleman who spoke last has forgotten one thing; and that is, when these places are built they are presumed to be built according to the latest idea of architecture as far as might be procured, at considerable expense to the county. And may be these men have held office and may be they have not. It would be no disgrace if they had held office. It is well known that the supervision of the jail or the building in which these unfortunates are kept, is under the board of supervisors or commissioners of the county. They have a standing committee who visit these places. And they are not exclusively under charge of the sheriff, and the sheriff's duty does not wholly extend to the care or keeping of these places. But they are as I think more under the super-

vision of the committee who are appointed to look after them than they are of the sheriff.

I was very much entertained by the paper that was read, from the high position that it took in stating that these people were unfortunate and that the keeping of the jail should be for uplifting and making them better. I was amused in fact about some of the inmates of those places,—that there should be different grades for their keeping. Of course there are some that it would be like putting the pig in the parlor. In the eyes of the law all are presumed to be innocent until convicted. It occurs to me, from the presumption that the law throws around every citizen that he is innocent, that we should make a place that is agreeable in its surroundings. In speaking of order, I don't see how improvement could be made. But it occurs to me that as the small light and air there is very bad, the only question that remains is to make that a place well adapted to the keeping of these unfortunates until some more suitable place could be found, would be to give them better ventilation.

Mrs. Ward, Charlotte:—Do you allow ladies to speak in this convention? This talk interested me very much. There is one thing I want to speak of. I found a boy fourteen or fifteen years old, he told me he was put in jail for some trifling offense. What I noticed was this boy was right in the same apartment with other prisoners, and there were none of them closed up in their cells, they were together. Some of them were old men who were in there for all sorts of crime. It seems to me it was doing this boy more harm shutting him in there than doing him good.

H. S. Maynard, Charlotte:—This matter that the last speaker has brought before the convention has bothered the legislators and every thinking man from the time that he began to convict persons. It is impossible I suppose to have a different jail for every person. The supposition of the law is that every man who is arrested be he old or young is innocent. The practice however, is far different. It is impossible, in the state of society as we have it at present, to wholly take care of this question. There is no man that has to deal with criminals but what he will find at every step something that pains him, from the time he begins with the business; and you all know I have had some experience with this matter, and with sending different persons to the places of imprisonment, as have several others who are in the audience. The probabilities are that we never convict a young man and send him to prison but what we feel as much sympathy for him, as badly as if he was a relative of our own, and sent him to jail. But it does not seem proper to place them in separate places. We have in the jail one or two rooms where they try as much as they can to keep them separate, but it has not been very practical as yet to do that. It has never been solved so that it can be done properly yet.

The law provides that we shall have one jail. People who are convicted of crime have to be placed there for minor offenses. We place the young men from the first start with hardened criminals. Every decent person turns his shoulder from them, and there does not seem to be very much of an opening for a decent and respectable life after they have once been imprisoned. But it is very seldom in the experience that I have had here some six years in the place, that there has ever been any results such as they should receive for the work that they have done there. If the calling of this thing before the meeting shall result in a reform in this direction, it will be one of the best things that they have accomplished in this convention.

WATER AND ICE.

BY DR. MARY E. GREEN, CHARLOTTE, MICH.

Mr. President, Ladies and Gentlemen:—It would be quite impossible to make even this intelligent audience understand the dangers arising from impure ice, without first telling you something about water, for ice is simply congealed water, or water in a solidified form.

The average person does not consider the necessity of water unless deprived of its use. It is however one of the most necessary and indispensable articles which nature has bestowed upon man. The various functions it performs in the body render it even more necessary than food. Certainly we can live much longer without food than water. Were it not for water the food that we daily use would not be assimilated, for it acts as a solvent rendering fluid and capable of absorption all of the food nutrients, and is also the medium for removing all waste material.

Nutrition and secretion are transmitted through the membranes and waste and repair are maintained by its presence. It is estimated that about four pounds of water are required in the food and drink of the average person daily. The pliancy, toughness, suppleness, elasticity of the tissues, even beauty itself, would all be wanting if we were not abundantly supplied with water. A mummy weighing no more than ten pounds is simply a human being minus water. One author says "Incredible as it may seem, a muscular Life Guardsman is little better than a pumpkin, he is only another form of a water-melon after all. If he were put into an hydraulic press he would be able to sink into his shoes with the greatest ease." Hence, if water forms the larger portion of our food and our bodies it follows that if we would be kept in the best health and repair, we should be supplied with an abundance of pure water. By this I do not mean that water must be entirely free from mineral substances which it holds in solution, for inasmuch as these salts are a part of our system, a reasonable amount may be classed as food. When water holds various mineral salts in solution in such quantity as to render it unfit for domestic use, they are used medicinally, such as sulphur, soda, iron, and these are usually grouped as mineral waters. For domestic purposes we have rain water, surface water, such as ponds, lakes and rivers, wells both deep and shallow, and springs. Rain water when uncontaminated by the smoke and dirt of the cities, is a reasonably pure water, but owing to the impurities which it washes from the atmosphere, and the manner of collecting it in the cisterns in villages and cities it is objectionable for drinking water. During the dry season when the whole atmosphere is filled with dust, and the ground is parched and dry, then, according to Miquel, bacteria are most abundant, while the germs which develop mold, thrive most in damp weather. After an especially dry time the water as it flows into lakes, rivers and ponds, carries an abundance of organic germs. These surface waters if in remote places are reasonably pure although liable to contamination from organic substances, such as decaying vegetation. If near cities they would not only have organic substances but refuse of factories, the poison from proximity to cemeteries, or from dead animals and sewage. Any or all of these may so contaminate water that it is unfit for domestic use without boiling. Nature has indeed

been bountiful in giving us water, but we are often our worst enemies by not exercising greater care in keeping it pure.

Wells are deep, as the artesian and drive wells, or shallow such as the open surface well of only a few feet, or the brick or stone well of greater depth. The old stone-lined, moss covered well, with its open moss covered bucket, which inspired the poet, was all well enough for the poet to enthuse over, but from a sanitary point of view there was no inspiration for either health or longevity. Any open well has very serious objections.

Appearance and color of water are no tests of its freedom from organic germs. The clearest, most sparkling water often contains the germs of typhoid fever or diphtheria. Many waters are brownish from a peaty soil which are not necessarily unwholesome. Again, waters which are charged with sewage may be bright, sparkling and colorless although deadly from the presence of bacteria. The same water varies under different conditions of soil. The Missouri river, for instance in Montana, near Helena, where it flows over a granite bed, is of remarkable clearness and purity, but the same river after coming through the bad lands of Dakota, has taken unto itself so much mud that in the hundreds of miles as it passes through the States of Nebraska, Kansas and Missouri, until it empties into the Mississippi, it has not become clear, and may be traced as a distinct stream for miles after it empties into that river.

We all use a large amount of water for domestic purposes for the removal of dirt from various things. When saturated with filth, it is thrown out to find its way throgh the soil, to wells if they be in close proximity to drains, or to the water bed below, or if we have sewerage it is carried to the surface water direct. Yet far more disastrous is it to have the emanations which pass from the system, especially during the summer and fall months, when the intestinal troubles and fevers are developing poisonous germs, thrown out without disinfection to be carried away by sewerage or possibly to find its way to wells. These germs rapidly multiply and produce disease, and if carried to our drinking water are certain death. There are many popular notions about drinking water which are not correct, one is that water by being exposed to the action of air and sunshine as in a running stream will purify itself. This is not so, although in being carried a long distance, the water is aerated and many of the poisonous germs are lost. Another idea that if fish live in water it must be pure. Nothing could be more fallacious than this idea. Fish do live in water which is not safe for drinking purposes. I think fish, like plants, may have some sort of a chemical laboratory of their own, whereby they may assimilate impurities and transform them into wholesome food. We know that the lettuce, rhubarb, mushrooms and asparagus will thrive and develop a freshness and flavor from the compost heap, as they will nowhere else. Man in his higher development as yet, has not been known to transform effete material into life and health. Organic matter, whether of animal or vegetable origin, is liable to produce disease.

Nichols gives two excellent guides for the selection of water:

1. "A water suitable for domestic supply, must be free from all substances which are known to produce an injurious effect on the human system, or which are suspected with good reason, or good authority to produce such an effect.

2. The water should be as far as practicable free from all substances, and free from all associations which offend the general esthetic sense of the

community, and thus affect the system through imagination, even if there is good reason to suppose that it is in itself perfectly harmless."

So far as the water supply of Charlotte is concerned we have reason to be justly proud. Our citizens proceeded in a very commendable and sanitary way when they established a system of water-works, and sent samples of the several varieties of water for analysis to ascertain its purity before deciding upon the one to supply us for domestic use. It would be well that wherever ice is used to have it subjected to the same analysis. All that has been said of the necessity of pure water applies to ice as it is only water in another form. Just at this particular time of the year I hardly expect to interest you in ice. You may perhaps shudder to think of it, nevertheless, in the summer with the thermometer from 80 to 90 degrees there is nothing that brings us more comfort than ice, whether it is the crystal lump in our glass of water, tea, lemonade or milk, or for the various uses which we put it to in our homes. While nothing is so grateful to the fever patient as cracked ice, and yet while we use it we may be unconsciously taking into our system the germs of some fatal disease. If we hold up a lump of ice it is extremely beautiful, reflecting the prismatic colors of the rainbow, and we are loth to believe that nature has locked within its icy grasp anything which would be deleterious to any mortal. But let the melting kiss of the sun's rays only reduce it to its original state, and we may by the aid of the microscope find it teeming with bacteria.

The French government has recently begun investigations of the extent to which microbes or bacteria may be found in common ice. M. Riche was employed to conduct bacteriological study of ice, and discovered that specimens which to the eye were perfectly transparent, seeming to be wholly free from any sort of impurity, may contain as high as seven times the amount of organic matter which is considered tolerable for drinking water.

In one specimen of ice examined each cubic centimeter which is about one-fourth of a dram, or one-fourth of a teaspoonful, was found to contain 175,000 microbes. The organic matter contained in this ice, was forty times that considered allowable for drinking water, and I hardly imagine that the ice of France is much worse than that of America. You will often hear it said that freezing purifies water. This is not so as far as organic matter is concerned. In freezing, water may deposit some of the coarser organic matter, also the salts. We are sometimes astonished when a piece of ice is brought to us with bits of sticks, grass, leaves, or bugs imprisoned, yet these are comparatively little harm as compared to the germs which are unseen. It is stated that the typhoid fever germs which cannot be seen with the naked eye may be frozen for months in a block of ice without at all impairing their vitality. About the only things that are certain death to them are steam and the chemical disinfectants. I read the other day that bacteria had been shot from the cannon's mouth and were not at all disturbed by the explosion. It happened in this way, that a cannon ball was inoculated with some bacteria, and then shot through a cake of gelatine, which had been previously sterilized. Now there is nothing which bacteria like so well or in which they multiply so rapidly as gelatine. Well, after the cannon ball had passed through, the gelatine was examined when it was found some of the bacteria had stopped off and had already established a colony, and were increasing with their usual rapidity. Again bacteria cannot be digested, many cases of tuberculosis,

diphtheria and many epidemics of typhoid fever have been traced to milk from cows which had drank water contaminated with sewage. So if you can't freeze, digest, or kill bacteria with a cannon, there is but one way and that is to protect ourselves against them, and be sure they do not get into the water or ice. Ice should be subjected to the same examination as water.

Many people who are extremely fastidious about water, never question about ice. Icewater and advanced civilization are closely allied, but with this advance has come also the advanced physician, who has discovered that nearly all diseases are filth diseases or preventable diseases. There is no longer a mystery connected with medicine. Sanitary Science is the key which has unlocked the door of ignorance and prejudice and bids everyone to breath pure air, eat wholesome food, use pure water and ice, and be clean. The diseases thought to be the dispensation of Providence, are now controlled by attention to these things. Bacteriology has done much towards making people more intelligent, but only by the unceasing vigilance of all united can the best results be obtained. Sanitary reforms like all others have had to pass through odium and persecution. How then shall we have pure ice? In this way: when ice is obtained from any place where water would not be considered wholesome, do not use it. There is one sure and certain way of having good and pure ice and that is by manufacturing it. I believe that every city which deems it necessary to have pure ice should have an ice plant and manufacture its own ice, or bring it from distant lakes known to be free from sewage. Some one is asking what is an ice plant? It is a system of producing cold, or eliminating heat from water. What is known as the Linde system was introduced some 18 years ago by Prof. Linde of Weisbaden, and is based upon the evaporation of anhydrous liquid ammonia, which is a substance peculiarly adapted for refrigeration and is the most economical agent known, as the heat necessary for evaporation, is extracted from surrounding bodies as it flows through the pipes, and the ammonia is used over and over again. This is the system used in cold storage.

The apparatus necessary for an ice plant on this system consists of the compressor, the condensor, and the generator, which is combined with the refrigerator.

Is manufactured ice expensive? The first cost of the plant is considerable just as the system of water-works is expensive but from the ice plant there is a revenue, in the sale of ice and from the cold storage which is of inestimable value for storing eggs, butter, and meat which is always better for being kept for some time, and would undoubtedly be patronized by every grocery in the community for storing perishable goods, during the summer and thus placing food products before the people in a more wholesome condition. Like water-works an ice plant could be owned by the city. There is a satisfaction in a city controlling those things which are of vital importance to the community, and it should be under the supervision of the board of health. The expense of manufactured ice is about the same as natural ice. In Chicago during the Columbian Exposition when everything was somewhat high, the manufactured sold for five cents a hundred pounds more than we were paying in Charlotte for unwholesome ice made from surface water. I was told by a lady in Cincinnati, who kept a large boarding house and had thoroughly tested both the natural ice as shipped from the north and the ice as made in that city, that the manufactured ice lasted fully $\frac{1}{3}$ longer. That may seem to be

quite a difference, but remember that the manufactured ice is produced from distilled water where all the air is expelled, thus producing a block of solid crystal ice.

The natural ice is always more or less filled with bubbles of air, and is often mixed with snow, which act as impurities and detracts from its keeping qualities. Finally, I would make an appeal to the health board of every city to investigate the source of ice supply, and if obtained from water which is contaminated by sewage, drainage from slaughter-houses, cemeteries, or from stagnant pools, then report it to the common council. If they are however in doubt then as to its purity send samples for analysis. The people have the same right to be protected against impure ice that they have against impure water.

DISCUSSION OF THE SUBJECT.

Dr. W. E. Newark, Charlotte: It is with a feeling of no little embarrassment that I appear before you, for two or three reasons; one is that I did not know what part of this subject would be assigned to me until two or three days ago. Then, I do not like to criticize, as would seem necessary in giving a correct report of the facts about the "Ice Supply of the City of Charlotte." Of course I was nearly a stranger to most of you here in the city, and I had heard various reports about the ice, and were it not that I can prove by others that this report is true, I would not dare to offer it to you.

The receptacle is in two ponds over in the north part of the city, and the water that fills these ponds comes from Butternut Creek. We have been told all about the soil round and about the city of Charlotte so that I need not repeat it. Suffice to say that it is very coarse. I wish to call your attention to the source of this stream of water. It rises several miles southeast of the city in several swamps, which it drains. Of course it is loaded with all forms of malaria poison and such things as are found in swamp water. This creek with several branches drains a large area of swamp. Of course none of us would think for a moment of drinking swamp water. We have been told in the able paper just read that freezing does not purify this water. With this idea in mind, I noticed this water supply a little farther, and to my astonishment I found that the slaughter-houses where the meat of the city was prepared or the animals were slaughtered, were situated on the banks of this stream. I supposed that this offal or the refuse was certainly burned or destroyed. But to my astonishment I found that this had accumulated perhaps for years, and at last there are many tons of this matter lying right on the banks of this creek. And the day that I visited this place the stench there was a worse odor than I had ever come in contact with before. What it would be in the heated days of the summer I could not imagine. This matter from these four slaughter-houses—I believe three or four—the matter lies there which will be washed into this creek by the sun and rains of the winter, and will be carried down to these ponds, and there retained until it is frozen.

It seems to me that it would be hard for anyone to draw a picture more awful than the idea of the people of the city of Charlotte drinking water from this supply. I should not like to advise anyone to use it in any form, ice that must be as impure as this. Now if you think I have exaggerated any part of this picture there are those in this room who can corroborate

my statement. This offal from the slaughter-houses, I think that in some way or other that provision ought to be made for it to be cremated. I think the proper way would be to compel these butchers to care for their own waste material; that is, if they were compelled to cremate this every two or three weeks in the summer months, and perhaps once through the winter it would be a good plan. We could not obtain our ice from any impurer place than these ponds.

H. S. Maynard, Charlotte: It seems that there must be a mistake. I saw right on the side of the ice wagon, "fresh pure spring ice."

Dr. Mary E. Green, Charlotte: In connection with one of the slaughter-houses and possibly more, there are a number of pigs that are kept. The offal of the animals and the blood is saved for the pigs. There is the accumulation for years there from that pig sty.

Question: What becomes of the pigs?

Answer: I don't like to answer. But I want to tell you all that I never eat pork that is in our markets in the summer. I am afraid that it comes from there. They come from somewhere. Somebody eats them. There is a request that Mr. Wells give us a few words on this topic.

Hon. Frank Wells, Lansing: MR. CHAIRMAN—I am a dealer in ice.

Mr. Bishop, Charlotte: They say that this ice all comes from Butternut Creek. This stream that this pond is on empties into Butternut Creek about half a mile away from the pond. So I don't see how it gets any Butternut Creek water. There is a dock between the Butternut Creek and this pond, and this pond is filled from what most of you know as Munson's stream. And there is where the ice is raised from in this other pond. The Butternut Creek lies between the pond and the cemetery. I am not here to say that the ice is pure any more than any other ice, but I think it is fully as pure as that which is raised along some of the rivers.

THE PREVENTION OF CONSUMPTION.

BY HENRY B. BAKER, M. D., SECRETARY STATE BOARD OF HEALTH, LANSING.

The subject upon which I have been asked to speak to you tonight is the most important one which can come before a sanitary convention. It is difficult to express to you how important this subject is, to every one of us, to people generally, and to the State. In this State, in every year, about three thousand persons "catch" or contract consumption. In every year three thousand of our people die of consumption. I have estimated * that this involves a money loss to the people of Michigan, of at least three millions of dollars. The relative importance of consumption, compared with the other dangerous diseases, is shown by the diagram which I show you, a copy of which is on the last page of the leaflet on Consumption which has been distributed in this audience.† In Michigan, and generally in most countries, about one-eighth of all who die die of consumption. This is bad enough, but the facts are still worse when we know that the death-rate increases rapidly as soon as the age of fifty years is reached. In this audience a large proportion of us have already reached that age when the danger of contracting and of dying from consumption is great,

* Proceedings Second Annual Conference of Michigan Health Officers, Ann Arbor, June 14 and 15, 1894, p. 34.

† The diagram is printed on page 98.

and constantly becoming greater as age increases. Consumption has come to be known as "The great white plague." And, so long as it is not restricted, our horror of it is not lessened by a knowledge that the disease is certainly communicable. There is no longer any doubt on this point. But it is just because it is communicable that we have now gained that knowledge which should enable us to prevent consumption. Not that any person who chooses can avoid it, that cannot be done, because in our close relations with our neighbors "no man lives to himself alone;" but if we all work together for the common good I believe it is now entirely possible for consumption to be almost entirely prevented. To tell how this can be done is the purpose of this address.

Although no person can alone fully guard against taking consumption, there are many things which every person can do to lessen the danger of taking it; and unless people generally will learn how consumption is spread and will generally coöperate for its restriction, consumption will continue to be the greatest cause of deaths. Therefore, my first duty is to point out the specific cause of the disease, how it spreads, and what must be done to restrict it.

The specific cause of consumption, without which the disease does not occur, is not an animal, but it is one of the smallest of living things, a plant, which is colorless and nearly invisible until it is stained, and then is visible only by the aid of a powerful microscope, being only about one-fifteen thousandth of an inch in length; and its breadth is only about one-sixth of its length. It is important that we get and hold in our minds a distinct image of this germ of consumption, so that we may have that "scientific use of the imagination" which will enable us to see with "our mind's eye" this greatest of all causes of deaths, wherever it is distributed.

On the last page of the leaflets distributed here this evening, is a drawing representing a group of individuals of this species, magnified one thousand diameters.* The germ is called the *Bacillus tuberculosis*. Bacillus means rod-shaped; and the diseases caused by this bacillus are generally tubercular, the most important one being tubercular disease of the lungs, commonly called consumption.

The deadly effects of this disease are caused sometimes by the actual destruction of lung tissue, but generally by the powerful poison which is given off by this plant during its reproduction and growth. The poison is called tuberculin. It can be separated from the rod-like germs which are the cause of consumption.

These little rods are colorless, in their natural condition, but in order to make them visible they are stained by aniline dyes and other substances; and with such stains these minute plants behave differently than do the animal tissues of the human body. That fact has, at last, after centuries of time, made it possible to find these germs of the most important disease which now afflicts mankind.

Where and how does this germ, our worst enemy, live? It lives within the body of man or of some other warm-blooded animal; one reason for this is that it does not thrive at the ordinary temperature of out-door air; and another is that it needs for its sustenance the fluids and tissues of living animals. How does it get from one living body to another? This is the question the replies to which should supply us with just that knowledge necessary in order to avoid this great destroyer.

* In the diagram on page 99, drawing No. 2.

How the Parasite gets From one Living Body to Another.

The victims of this destructive parasite generally soon die and, with all the parasites they then contain, are buried in the ground; but before the death of the host the parasite usually has had abundant opportunities to be scattered so widely that, heretofore, the continuance of the species has been very thoroughly provided for.

There are a number of ways in which this microscopic parasite may come from one body to another; such as through the eating of insufficiently cooked flesh of an animal in which the parasite is, through the use of uncooked milk of such an animal, and through inoculation of the germ through any break in the surface of the body. In rare instances the germ passes from parent to offspring; but heredity is not so important as has been supposed. By far the most important and most common way in which the germ leaves the human body is in the sputa of a person having pulmonary tuberculosis, commonly called consumption of the lungs. That which is coughed up by such a person contains these germs of disease in numbers too great to be counted. So long as this substance remains moist the germs are not likely to be much scattered: about the only danger then is that they may come in contact with some broken place in the skin, or in some unusual way gain entrance to the body. But unfortunately these germs are not destroyed by drying; and, so soon as they become dry, their smallness and lightness favor their becoming a part of the floating dust in the air, and when this occurs they find ready access to the lungs of whoever comes within the area infected by them. Thus we see just how it is that consumption is an infectious disease. It is a communicable disease. As the law is phrased, it is a "disease dangerous to the public health," because the germs given off in the sputa of one person sick with consumption are liable to be scattered, breathed in, and cause the disease in many other persons. It seems to be proved that the disease is most frequently caused by the germs of the disease entering the mouth, nose, throat and lungs with the in-breathed air.

The Restriction and Prevention of Tuberculosis.

Knowing, as we now do, just how tuberculosis is generally spread, and just how it is contracted, we are in a position to act intelligently for its restriction and prevention. The most important measure is the immediate disinfection of all consumptive sputa. And since all sputa and all discharges from the nose so frequently contain germs, which are capable of reproduction, and so of spreading some disease, all sputa and all discharges from the nose and throat should be so dealt with as that it shall be at once so isolated that it cannot infect any person or area, and that it shall be destroyed or disinfected as soon as practicable. I have read that for a long time after pocket handkerchiefs were first brought into use they were properly regarded as unclean and not to be exhibited in polite society, but that a French queen is responsible for their coming to be ornamented and generally exhibited. Undoubtedly the careless shaking out of handkerchiefs that have been once used is not infrequently responsible for the spread of disease; and of the diseases which may be thus spread, the list is somewhat long. A sanitary fashion-book should ordain that no handkerchief that has been once used shall be shaken out in the presence of any person, nor where the dust from it may be inhaled by any

person. As an illustration of how important this is in the case of consumptive sputa, the instance may be mentioned of a lady who contracted consumption by crumpling up and shaking out the handkerchiefs used by her consumptive husband. She contracted pulmonary consumption, and died. In South Carolina, at a resort for consumptives, I was told by physicians that the negro washerwomen not infrequently contract tubercular disease from washing the handkerchiefs of consumptives.

These two instances illustrate the importance of disinfection of the sputa of every consumptive, before there is opportunity for the germs to become dust, and before the moistened sputa comes in contact with the flesh of any person. The State Board of Health has recommended that "The consumptive should carry small pieces of cloth (each just large enough to properly receive one sputum) and paraffined paper envelopes or wrappers in which the cloth, as soon as once used, may be put and securely enclosed, and, with its envelope, burned on the first opportunity."

Now that we think that we know just how this most important disease can easily be restricted, it has become important to have this knowledge reach all the people, and especially those who are in greatest danger of contracting the disease. Such persons are in deadly peril. They can be saved only through gaining a knowledge of their danger, and of how it may be avoided. The State Board of Health has, a few years ago, entered upon the work of getting such knowledge before the people of Michigan. At its meeting in September, 1893, it adopted a resolution as follows:—

"*Resolved*, That hereafter, consumption (and other diseases due to the Bacillus tuberculosis) shall be included in the official list of 'diseases dangerous to the public health,' referred to in sections 1675 and 1676 Howell's statutes, requiring notice by householders and physicians to the local health officer, as soon as such a disease is recognized."

The purpose of the resolution is to secure, to the local health authorities and to the State Board of Health, information of the location of each case of well-developed consumption, with the view of placing in the hands of the patient reliable information how to avoid re-infecting himself or herself, and how to avoid giving the disease to others; also with the view of placing in the hands of the patient's family, or others most endangered, information how to avoid contracting consumption. Also with the view of instructing superintendents of public buildings how best to restrict the spread of the disease. Without such information, thousands will contract this deadly disease, and die. With such information, it is believed that hundreds of those persons may be entirely saved.

There is good evidence for such a belief, in the experience in Michigan in the restriction of scarlet fever. When, about twenty years ago, the State Board of Health began to teach the people of Michigan that scarlet fever was a "disease dangerous to the public health," the Board met with the opposition of prominent men in the medical profession. However, the Board persisted, and it did so by a method very similar to that which it is now proposed to employ with respect to consumption. The essentials of the method are as follows:—

1. Notice to the local health authorities is required to be made by the physician who is called to treat a case of the disease, also by the householder, in case the physician neglects the duty.
2. Prompt report by the local health officer to the Secretary of the State Board of Health.

3. Prompt response by the Secretary of the State Board, supplying the local health officer with copies of a leaflet or pamphlet, telling just how to restrict the disease, with request that the local health officer cause them to be distributed to the *neighbors of the premises* placarded for that disease.

The results of this method of action are very interesting. Some years ago I concluded that the action had been in operation long enough for its results to begin to show, in the mortality statistics collected and published by the Secretary of State; so I compiled a table of the mortality in Michigan by years before, and by years since that method of action was adopted. This table showed that a very considerable reduction in the mortality had occurred during the years the distribution of pamphlets by the State Board of Health had been in operation. At the meeting of the National Conference of State and Provincial Boards of Health at Toronto, Ontario, in 1886, I had the honor of presenting that evidence of the success which had followed the action in Michigan. A prominent sanitarian who has been the executive officer of one of the oldest State Boards of Health, since its organization, said "That if it was true that there had been a diminution in disease in Michigan since the organization of the State Board of Health, owing to the distribution of circulars and documents, then there was a new means of prevention." * Well, it was true that there had been such a diminution in scarlet fever. And that diminution has continued, so that, from the time the work began—in 1874—up to the close of the year 1890 the death-rate from scarlet fever in Michigan was less than one-half what it had been previous to the beginning of the work.† I attribute a very large part of this decrease in the death-rate from scarlet fever to the intelligent coöperation of the people, with physicians and health officers, in the two principal measures which the pamphlets have taught to the people of Michigan—namely isolation and disinfection,—isolation of all infected persons and things, and their complete disinfection before coming in contact with healthy persons.

I wish to ask attention to the fact that the method employed by the State Board of Health, does not consist simply in printing pamphlets containing the best that is known on the subject of restricting a given disease, and then distributing copies of that pamphlet indiscriminately. If the distribution were in that manner, most of the pamphlets would undoubtedly go into waste baskets, without having been read. It would be like striking iron when it is cold. The method which the Michigan State Board of Health has employed is like "striking the iron when it is hot," so that an impression may be made, deep and lasting. The pamphlets are distributed to the neighbors of the persons sick with the dangerous disease. Sooner or later that disease occurs in every part of the State; therefore, after a time the people in every locality have had the pamphlets placed in their hands at a time when, because of the known proximinity of the dangerous disease, their own household has been threatened. Under such circumstances they are ready to receive the statements put before them by the State Board of Health. The result is that the people throughout this State quite generally now know that scarlet fever is a disease which may be restricted. They are much more ready to coöperate with the health officers for its restriction than they were before that "campaign of education" had been planned and executed.

* Page 58, Proceedings of Conference at Toronto, 1886.

† This is proved by the first two columns in the diagram on page 104.

The office of the State Board of Health has a force of clerks constantly employed in this "campaign of education" relative to these communicable diseases which cause most deaths in Michigan. But, while much can be done relative to any disease which, like scarlet fever or small-pox is promptly reported, little can be done relative to any disease which, like consumption, is not promptly reported. Relative to such diseases what is done is of that sort which I have likened to striking iron that is cold. The State Board of Health has printed ten editions of its pamphlet on the restriction of scarlet fever. One hundred and forty-six thousand copies have been printed. But of its leaflet on the Restriction of Consumption only two editions, ten thousand copies in all, have been printed. To be sure the work on scarlet fever began some years first; but relative to scarlet fever we are distributing about fifteen thousand copies per year, while relative to consumption we cannot find place for more than half of that number. In order properly to carry on the "campaign of education" relative to consumption, we need to know just where each consumptive person is, so that we can send our valuable information where it is needed, and where it will be likely to be read, and to some extent in some instances acted upon.

What I have said will serve to indicate one very important reason why consumption should be promptly reported to the local health authorities, and by the local health officer to the State Board of Health. Then the local officers should place in the hands of the consumptive person, and in the hands of those most likely to be endangered by the consumptive person, and in the hands of those who control the movements and actions of persons liable to spread consumption, plain instructions how to restrict the disease. This is made practicable by the State Board of Health, which supplies leaflets of such instructions for such purposes. I have distributed here samples of such leaflets, of which I shall be glad to have each person here have a copy.

The leaflet was undergoing preparation during several years, and it is believed to contain very condensed and reliable statements of the leading facts applicable to the restriction and prevention of consumption.

Fallacies.

In the minds of some people there seem to be fallacies which prevent them from understanding how it is possible to restrict the dangerous communicable diseases.

The first fallacy to which I refer is that the germs of the dangerous communicable diseases are always and everywhere present, the idea being that, the germs being always present, the "epidemic condition of the atmosphere" is what makes it possible for the disease to spread. We now believe that, for months at a time, the State of Michigan is entirely free from the specific cause of small-pox; we believe that many localities in Michigan are for months at a time, entirely free from the specific cause of scarlet fever, and of diphtheria. I believe that the homes of the people of Michigan are, as a rule, nearly free from the specific cause of consumption, even though the germ of that disease is perhaps more generally spread throughout the State than is the germ of any other dangerous disease. There are probably at least three thousand new cases of consumption occurring in Michigan in every year, and three thousand deaths. In the

three thousand households in which the disease has found lodgment, the specific cause is liable to be thoroughly scattered. Some of those households in which the sputa are not carefully dealt with, are dangerous centers of infection. And the *public places*, visited by some of the thousands of coughing consumptives who are now in Michigan, are especially dangerous centers of infection, especially those public places which like postoffices, are liable to have the sputa of visitors deposited on the floor. But the idea that tubercle bacilli are generally distributed, so that all of us are necessarily inhaling them frequently, I believe is a fallacy. I think that the experiments by Koch and by Cornet have proved this. Cornet has proved that tuberculous infection is not found in the dust of streets and in many other places, except in isolated instances. It is a fallacy which I think does much harm, because it leads people to think that it is not practicable to avoid contracting this dangerous disease, except through ordinary hygienic measures, which I believe we now know to be not always sufficient to prevent the disease. It now seems probable that, given the introduction of a sufficient number of the speciffic organisms which cause consumption into the body of any person, however vigorous, the disease may be established in that person. Furthermore, it seems to be proved that however debilitated or enfeebled a person may be, consumption does not occur except through the introduction of the specific cause. (Much could be said on the subject of how to keep the human body so as best to resist the contraction of consumption, but that is not the subject of this paper.)

Another fallacy is that which leads some people to believe that the germs of consumption, and of other diseases, reproduce in the atmosphere. The conditions under which tubercle bacilli reproduce are quite well known. For their reproduction they require the presence of organic material, and a temperature not ordinarily reached by the atmosphere. They can be artificially propagated in and on nutrient substances kept at the temperature of the living body, but they are not naturally propagated outside of a living body. Tubercle bacilli are what are called "Obligate parasites."

Another fallacy, is that which causes persons to reason that because we cannot hope to destroy all the germs of the disease therefore there is no use in trying to destroy any of them. How false this mode of reasoning is, may be seen by applying it to that other disease which I have mentioned—scarlet fever. That reasoning was so applied by some persons in 1873; but in 1893, we knew that many thousands of lives had been saved in Michigan by our efforts to restrict scarlet fever. That some other lives were not saved, does not change the fact that thousands were saved. And those thousands were worth the effort.

Some person may say that consumption is not scarlet fever, but my belief is that consumption is a communicable disease; that it has been proved to be such by the most scientific methods of experimentation, experience, and reasoning; that it is now held to be such a disease by a great majority of the leading men of science who are best qualified to judge. I think we know how it is generally spread, and about what proportion is spread in one manner, and what in other ways. On this last mentioned subject I will, in a few moments, mention a few facts; the fact of its being a communicable disease has, I think, been too well proved to need further evidence. The way whereby the bacillus has come to be known as the cause of the disease may be interesting to you: What has long been

known as "The Germ Theory of Disease" is now established as true. As regards consumption, it was established by Dr. Koch. He formulated rules which all require to be fulfilled before a given bacterium or special micro-organism can be declared proved to be the specific cause of a given disease. These rules are:—

"1. The micro-organism must be invariably associated with the disease.

"2. It must be cultivated outside the body, and through several generations.

"3. Any one of these cultures must be capable of producing the disease if inoculated into a susceptible animal.

"4. The same micro-organism must be discoverable in the animal thus inoculated." *

These rules have all been complied with, by many competent observers, relative to tuberculosis, and the micro-organism which causes the disease has been named the *Bacillus tuberculosis*.

How Consumption is Spread.

The fact that consumption of the lungs has been caused by the accidental and by the experimental inhalation of the bacilli, in animals and in man, put with the fact that the greatest known source of the bacilli is the sputa of consumptives, and with the other fact that consumption of the lungs is the form of tubercular disease which is most common, is not all the evidence which has accumulated tending to prove that tubercular disease is usually spread by what goes out from consumptive lungs, and is usually spread to previously unaffected lungs,—in other words—spread by the inhalation of dust from dried sputa. Thus Dr. C. G. Currier, in a paper before the New York Academy of Medicine says: "Summarizing the observations made in two hundred and twenty-one autopsies of tubercular cases, Grawitz, formerly Virchow's assistant, reported one hundred and fifty-two cases as primary in the lungs, [that is to say, in this large proportion of cases the disease was first implanted in the lungs] nine as primary in the digestive tract, three arising from external wounds, and the original entrance of the infection was doubtful in the other cases." †

The evidence is strong that the greatest of all sources of danger is in the sputa of well-developed cases of consumption of the lungs. Therefore, it is of the greatest importance that such cases be reported at once to the local health officer, and by him to the State Board of Health. Fortunately it is in just such cases that the disease can be recognized with certainty. When that condition is reached, the friends of the patient are frequently able to recognize the disease. But the physician has, in the bacilli in the sputa, positive evidence of the presence of the dangerous element. If the attending physician is not sufficiently expert in the use of the microscope; or if he prefers to have such work done by a specialist, there are now those in all cities, and in many country villages, who will gladly do such special work for physicians. (In New York city the Board of Health will cause such examinations to be made. The same is true in the city of Detroit. And by request of the State Board of Health such examinations of sputa are now made at the State Laboratory of Hygiene at Ann Arbor, only the cost of the work being charged to the person applying for it.) It is a fact which is extremely encouraging, and leads to the hope that much may be

* Page 11, of "The Hygienic Prevention of Consumption" by J. Edward Squire, M. D., London, 1893.

† "1. Deutsch militararztl. Zeitschr, 1889, Heft 10, Ref."

speedily accomplished, that as soon as the disease reaches the stage of greatest danger to the public it is so easily and certainly recognized. If the bacilli are given off in very considerable numbers, they are to be found by the usual methods, with the microscope, by means of stains.

There are other facts which seem to warrant the hope that the restriction of consumption will prove to be easier than the restriction of scarlet fever. The specific cause of scarlet fever seems to be frequently given off from the body in such a form as to immediately become a part of the dust in the clothing, and about the patient. The specific cause of consumption is not often so given off. The exhaled breath does not contain it except when the breath is coughed out. The location of the specific cause is generally known; it is quite generally associated with a substance which is visible; it may be so treated that it does not readily become a part of the dust in the patient's clothing, or about the patient, or of the dust of rooms occupied by the consumptive person.

These being the facts, it seems quite possible for a consumptive person to so care for the general safety, that he may move freely in private and in public without danger of spreading the disease. But in order that this may be done, it is essential that the consumptive person have complete knowledge of the methods by which consumption is spread, and by which it is restricted. And this knowledge is not enough; there must be a conscientious determination to perform carefully all those duties required to make sure that the specific cause of the disease is promptly destroyed, and not permitted to endanger the life of another person. If the patient has not that knowledge, is incapable of comprehending it, or, having the knowledge, if he has not also a conscientious regard for the safety of others, the public interests demand that such a person having well-developed consumption of the lungs shall be isolated, for the public welfare, because *he has the most dangerous communicable disease now known to us.* The best place for all such persons is in a special hospital, where under well-planned rules and trained attendants the danger of spreading the disease shall be reduced to the minimum.

It is evident that the idea of isolating consumptives is exremely unpleasant to many people, probably to all, unless through a study of the subject it has come to be realized how great is the price humanity pays for the freedom accorded to consumptives. I believe it is practicable for intelligent conscientious consumptives to so act as to avoid spreading the disease; and to do this without any great degree of isolation. Relative to the isolation of consumptives, then, the question is restricted to the propriety of enforcing care for the rights of the whole people upon those consumptives who without compulsion are incapable of taking, or unwilling to take, the necessary care to avoid jeopardizing the lives of those who may come within the circle of their infection. For myself, I have no hesitation in expressing the belief that all such consumptives should be isolated. Insane consumptives should be isolated. Consumptives in prisons, poor houses, and reformatories should be isolated.

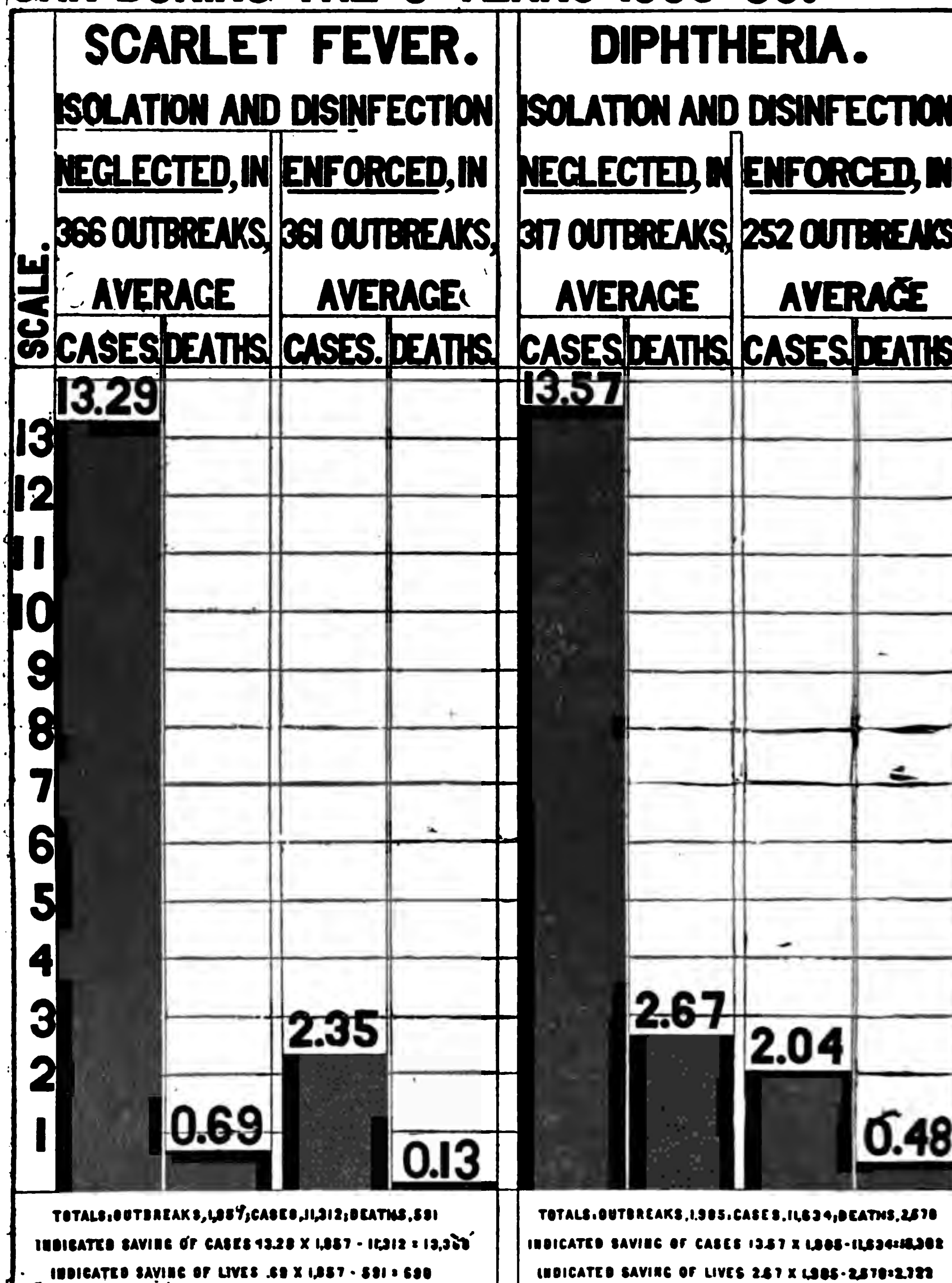
I think that all *public* buildings (including churches and buildings for schools and colleges) should be constructed and managed as if it were believed that some of their visitors will belong to a class of consumptives who will disregard the risk to the lives of the other visitors. The ventilating registers should be at the floor level; and all such precautions should be taken as will reduce to the minimum the danger of the inhalation of the dust of consumptives' sputa. Air that has once been the circuit

of an inhabited room should never be warmed over and sent around again to be breathed and rebreathed, with all of its accumulation of microscopic causes of consumption or other disease. I firmly believe that the "indirect" system of heating inhabited rooms—in which system pure air from out-doors is passed over heated pipes or radiators before it enters the room, is a powerful agent for the lessening of the spread of consumption and of all such communicable diseases; because in order to heat a room well by that method a quantity of air must constantly pass through, and if the foul-air exit is at the floor level, as it should be, much of the dust from the floor tends to pass out with the foul air, and therefore does not come up to be breathed in, as it does in rooms heated by stoves or by steam pipes or radiators within the room.

When I commend the "indirect" system of heating I refer to the system in which the pure air from out-doors is passed over heated pipes or radiators before it enters the room. I do not approve of relying upon air which enters rooms from corridors in which are placed radiators which there warm the air by the "direct" system. Such corridors are likely to contain the dust swept out of occupied rooms, dust from some one of which may be infectious. Such corridors are liable to receive infectious dirt or dust from the boots and shoes of persons passing through, not to mention the possibility of the sputa of such persons being carelessly let fall on the floor, which sputa when dried may add its infection to the dust which may rise, with the current of air from the radiator, and pass on through the transom to be breathed by the occupant of the room. When a case of diphtheria, tonsillitis, consumption or other disease which enters the body by way of the air-passages, gains entrance to a building heated by radiators in corridors, and ventilated by transoms over doors, there are likely to be other cases of such disease. In a disease like consumption, the period of incubation is so long that it is not often that its source can be accurately determined. But we now know that it is safest to avoid the inhalation of all dust that may contain the dust of sputa.

On the whole, the outlook is favorable for a speedy decline of this most important disease. I believe that consumption is a disease much easier than scarlet fever to restrict and prevent; yet the mortality statistics of the Secretary of State, and the sickness Statistics of the State Board of Health agree in proving that one-half of the sickness, and of the deaths from scarlet fever has disappeared. Small-pox formerly caused more deaths than any other disease. Now it is at the bottom of the list of dangerous diseases. (Refer to Diagram on page 98.) In centuries past, leprosy hospitals were scattered all over England. Now leprosy is rare. I believe those special hospitals had much to do with making leprosy rare. The period of incubation in leprosy is so long, and the disease is so easily restricted that we cannot hope that consumption will soon become as rare as leprosy; perhaps not as rare as small-pox; yet, aside from the protective power of vaccination, consumption seems to me to be a disease which is more easily restricted than is small-pox; and four-fifths of the mortality from small-pox in Michigan has disappeared through the system of notification, reports, distribution of pamphlets, and efforts of health authorities, work similar to that which it is proposed shall be carried on with reference to consumption. Statistics prove beyond question that where these measures are faithfully carried out, the cases and deaths from both scarlet fever and diphtheria are reduced by four-fifths.

ISOLATION AND DISINFECTION RESTRICTED SCARLET FEVER AND DIPHTHERIA IN MICHIGAN DURING THE 5 YEARS 1886-90.



(This is shown in diagram opposite.) I have no doubt that consumption will be reduced to an extent fully as great wherever these measures are faithfully carried out. Is not that a consummation devoutly to be wished?

Compared with ordinary life-saving measures, the restriction of the dangerous communicable diseases is of overshadowing importance. The United States Government has a Life-Saving Service, with its employees on every coast; and its savings of life and treasure are worthy of every such effort. Yet in the aggregate throughout the entire United States these savings of life and treasure are small compared with what has been demonstrated to be practicable in a single State like Michigan through the restriction of diseases. In Michigan thousands of human lives have been saved from small-pox, diphtheria, typhoid fever, and scarlet fever. It is proposed now to continue the work, and to apply some of the same methods, which have been so successful in these diseases, to the restriction of that disease which now causes the most deaths.

At a meeting of physicians in Philadelphia, some of the speakers argued that unless the board of health was to disinfect every infected house, and keep every house occupied by a consumptive free from infection, no attempt to restrict consumption should be made by the board of health. Let us suppose that this were said with reference to diphtheria or scarlet fever! Because not all lives may be saved, shall no attempt be made to save some lives? It has been proved in Michigan that in outbreaks of diphtheria and scarlet fever where isolation and disinfection are promptly and fully enforced four-fifths of the cases and deaths from those two diseases are prevented. Because these two measures are not always promptly or completely enforced, shall we abandon the work entirely? Certainly not. Under the *imperfect* methods of the past in this State the death-rate from scarlet fever throughout the entire State has been reduced one-half. If we can reduce the death-rate from consumption one-half we shall save the lives of fifteen hundred persons a year, in this one State of Michigan. I believe that this can easily be done, and that it is eminently worthy of being done. Each one of you may be able to aid in this grand work, because, in such work, man is his "brother's keeper."

DISCUSSION OF THE SUBJECT.

Question: Does the wasting away of the lungs always indicate tuberculosis?

Answer: Am I expected to answer that? I suppose I might say yes to that question, although I am not a practicing physician. It indicates it, although it does not prove it.

Anything which makes an opening into the body, and especially in that part of the body over which large quantities of air pass, tends toward the production of consumption if the germ be present in the dust in the air.

While I am on my feet I would like to suggest, with reference to the discussion which has occurred,* the thought that when this State Board of Health undertook to teach the people of Michigan that scarlet fever was a dangerous communicable disease, it met with more vigorous opposition than has been met with here this evening. The Board has been able to take up only about one disease at a time. It is now dealing with the most important thing that the people of Michigan can consider. But it expects in the end that that opposition will die away.

* That part of the discussion here referred to, does not seem to have been put on record, or if recorded it has been mislaid and has not been received for publication.

CLOSING OF THE CONVENTION.

George Huggett, Charlotte: If it is proper at this time, I will move that a vote of thanks be extended to the members of the State Board of Health for the part they have taken in this convention, and also to those who have contributed papers during the sessions.

Rev. E. G. Lewis, Charlotte: I will second that resolution.

The motion prevailed.

H. S. Maynard, Charlotte: It seems that there is one gentlemen in our city here who should be recognized at this particular point. About nine or ten months ago when we knew that in some other parts of the State they were holding these meetings, there was one gentleman here in the city who began to agitate the matter, and called it before the Common Council. He has been instant in season and out of season to make it a success. He with other gentlemen in the city have been engaged in this matter; more especially was he engaged in the first place. I move that a vote of thanks be extended to Dr. Patterson and to the Mayor for the interest which they have taken, and for the steps which they took in the first place to induce the State Board of Health to come here and hold this convention.

The motion prevailed.

Hon. Frank Wells: In behalf of the State Board of Health, I wish to say a few words. The very pleasant words with which you welcomed the coming of the board, and equally pleasant ones you have spoken as we part, have given, I assure you, the highest pleasure to the members of the State Board of Health. We thank you sincerely for these expressions of your good will.

We desire to say that these meetings have been unusually agreeable to the board. Very few, I think, of the sanitary conventions that we have held in the State have been as agreeable as has this. It has been especially so to us, because in your beautiful city we have tasted your hospitality, we have entered your beautiful homes, we have felt the kindly grasp of your friendly hands; all of which, I assure you, we appreciate most highly. The attendance at the meetings has been unusually large, and the audiences more appreciative than we usually meet. The papers that have been read by gentlemen living in your own vicinity have been most admirable.

The local conditions which some of these papers refer to are rather sore spots which I dislike to touch upon, but which I feel that it is my duty to do, and to again call your attention to them. There surely is danger lurking in the water in your wells. You may have an epidemic of that dread disease—Typhoid Fever—that will prove a source of the greatest grief to many of you who are using water from this source. The ice supply that has been so graphically described here by one of the gentlemen, is another source of danger that it is well for you to consider. And if you cannot have artificial ice, and cannot have any pure ice or ice from a purer source than has been described, I would advise you to treat your ice, as you should suspected water, and before you use it,—boil it.

If anything that the State Board of Health has done to aid you in these meetings seems to require any compensation at your hands, let such compensation be sympathy and aid in the general work that has been described; that they are engaged upon throughout the State in the restriction of the dangerous communicable diseases, and in the special work that they are now engaged upon in the restriction of that dread disease, tuberculosis. As we bid you farewell tonight, we indulge the hope that this meeting, which has proved of so much interest, may also prove of the greatest value to you in the promotion of health, and the saving of life.